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FINAL REPORT

SPACE TRANSPORTATION SYSTEM DISCONNECT

FAIRCHILD
STRATOS DIVISION

1800 ROSECRANS AVENUE, MANHATTAN BEACH, CALIF 90266

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FINAL REPORT

SPACE TRANSPORTATION SYSTEM DISCONNECT

Prepared for:

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Contract Number NAS-~~9~~ 8-32806

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ABSTRACT

Work described in this report demonstrates that the use of medium duty 300 psi fluid disconnects for orbital servicing is both practical and technically feasible. A prototype disconnect was designed and tested, based on criteria formulated from a survey of expected usage requirements for orbital servicing concepts. Testing involved the comparison of three seal materials (EPR, Neoprene and Teflon), and two test media (helium and Freon 21), and was conducted over a temperature range of -150°F to +225°F. Results indicated low helium leakage (10^{-4} sccs) and extremely low engagement forces (56 lb_f). Special testing was also performed on a new seal design. Design concepts for a cryogenic disconnect and a high pressure disconnect were investigated. Results of an industry survey for usable orbital servicing disconnects and areas needing attention in future studies are discussed.

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1.0 INTRODUCTION

The final report provides the history and status of the Space Transportation System Disconnect Program performed by Fairchild Stratos Division (FSD) under Contract Number NAS-8-32806 to George C. Marshall Space Flight Center.

1.1 Objectives

The objective of this program was to develop and qualify a fluid disconnect or family of disconnects capable of servicing a wide range of orbiting payloads. Servicing, in this context, implies mating of the Shuttle Orbiter with a satellite, followed by modular replacement and/or replenishment of satellite subsystems or experiments. The types of fluids generally include propellants, pressurants and coolants, as typically used in subsystems for attitude control, thermal conditioning, special experiments, etc. The use of fluid disconnects as part of an integrated orbital servicing concept provides the capability for replenishment, mixing, or exchange of on-board fluids to extend satellite orbital lifetime, increase payload, or vary experiments.

1.2 Program History

FSD received a contract in September 1976 from MSFC to design, develop, fabricate and test a fluid disconnect for Space Operation Systems. This original program was divided into two phases.

Phase I was to identify potential users and applications, formulate specific design criteria, survey available hardware and performance data, make hardware modifications if required and perform development testing on selected designs. Lacking available hardware, a disconnect was to be designed to meet the specified requirements, fabricated, and subjected to development testing.

Phase II was to update specification requirements formulated in Phase I and then update design, fabricate and perform qualification testing on two separate designs.

Funding for this program was $103,000 and the initial scheduled completion date was December 1978. In May 1977, it was determined that for lack of an available off-the-shelf disconnect, FSD would design, fabricate and test a new medium-duty disconnect (300 psig operating pressure). Conceptual designs for a cryogenic disconnect and a high pressure disconnect (3,000 psig operating pressure), were added to the program. FSD was also requested to support the Martin Marietta Module Exchange Mechanism (MEM) Demonstration.

1.2 Program History (continued)

In April 1978, FSD met with MSFC program personnel and redefined the effort. This change was a result of interest shown for a Freon 21 disconnect for use on the 25 KW Power Module. Consequently, the program was modified to fully support a Freon 21 disconnect. The program schedule was moved out to October 1979 but remained within the original budget constraints. Table I is a brief summary of the final Statement of Work (SOW).

1.3 Summary and Conclusions

Work performed by FSD has demonstrated that the use of fluid disconnects for orbital servicing is both practical and technically feasible. Contact with other companies involved in space activity has shown that much interest does exist for hardware that expands the scope of orbital servicing and that efforts in this field should continue.

FSD has designed and successfully tested a medium duty (300 psi) prototype disconnect following a thorough search of industry and government sources which failed to locate an existing off-the-shelf design suitable for the orbital servicing concept. Testing indicated low helium leakage (10^{-4} sccs), low engagement forces (80 lb) and demonstrated the capability of fluid transfer between simulated spacecraft after installation on a Module Exchange Mechanism (MEM) designed and built by Martin Marietta, Denver. In addition, a previously qualified JPL disconnect was identified as being adaptable for possible use with Freon 21 on the 25 KW Power Module and design concepts for a high pressure disconnect and a cryogenic disconnect have been laid out.

Development testing of the NASA prototype disconnect has confirmed the ability to achieve low helium leakage and low engagement forces. Problems identified lie in seal design and measurement of leakage rates when using Freon 21. The program slippage was attributed to program changes and additional testing done to help resolve the seal problem. This program was completed within the original budget.

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Table I. NASA Disconnect Statement of Work (April 1978)

- Determine Design Requirements
- Identification of Potential Users and Applications
- Survey of Available Hardware
- Design New Medium Duty (300 psi) Disconnect
- Fabricate Prototype Hardware
- Provide Prototype Hardware for Martin MEM Demonstration
- Development Test Program
- Design Hold:

    Layout of Redundant Seal Medium Duty Disconnect

    Layout of a Cryogenic Disconnect

    Layout of a High Pressure (3000 psi) Disconnect

- 25 KW Power Module - Freon 21 Disconnect

    Establish Requirements

    Test Hardware - NASA and JPL

    Test

- Final Report

1.3 Summary and Conclusions (continued)

Future work will be needed to refine the concepts and designs developed under this contract. Major areas needing attention include:

- Seal compatibility and containment with Freon 21 and MMH.
- Seal redundancy for reliability.
- Pressure balancing of more complex design to minimize engagement loads.
- Internal swivel to simplify disconnect/vehicle interface.
- Minimize leakage and spillage volume.
- Scale up the existing 1/2" design to 1" design for the 25 KW Power Module.

2.0 PROBLEM DEFINITION AND REQUIREMENTS

Initial efforts of this program involved the definition of the potential requirements necessary to provide the best disconnect for use in a broad range of applications. After discussion with MSFC and a review of expected usages, a set of basic requirements was prepared (see Table II). Primary design goals were low leakage and minimum engagement, retention and separation forces.

The initial intent was to provide a disconnect design from existing industry hardware. FSD had contacted eleven potential suppliers requesting technical data and designs on their disconnect. In addition, FSD selected WESRAC (Western Research Application Center) to assist with a survey of available technology for disconnects.

WESRAC, a non-profit computer search firm operated by the University of Southern California with the cooperation of NASA, can access all the major data files and can extract abstracts of interest by means of a cross-coupling of key words, modifiers, and exclusions. FSD, with the technical assistance of WESRAC, searched five major data files (CLAIMS/GEM, NTIS, NASA, ISMEC, and COMPENDEX). These files cover patents, general engineering, private industry, and government sources of technical data. A total of 213 "hits" were recorded, based on the list of key words, modifiers and exclusions. The corresponding abstracts were ordered printed. FSD reviewed these abstracts and placed orders for documents and patents of interest.

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Table II. Basic Requirements - NASA Space Transportation System Fluid Disconnects

1.	Classification:	Class 1: Low pressure, self-sealing, automatic open/close
		Class 2: High pressure, self-sealing, automatic open/close
2.	Size:	1/4 inch to 1 inch
3.	Fluids:	Class 1: Liquid Hydrogen
		Class 2: Inert gasses (He, N_2, etc.)
4.	Pressure:	Class 1: 100 psia (maximum operating)
		Class 2: 3000 psia (maximum operating)
		Proof Factor: 1.5X
		Burst Factor: 2.0X
5.	Temperature:	Class 1: -423°F to +150°F
		Class 2: -150°F to +250°F
6.	Leak Rates: (mated & unmated)	Class 1 room temperature: 1×10^{-4} sccs GHe -423°F: 0.1 sccs GHe
		Class 2 room temperature: 0.1 sccs GHe
7.	Spillage:	To be minimized (interface enclosed volume).
8.	Separation Force:	Pressure effects on engage/disengage forces and on separation force while connected must be minimized.
9.	Alignment:	Self-aligning within ± 5° conical and 1/16-inch offset.
10.	Life/Endurance:	10 years and 500 cycles.

2.0 PROBLEM DEFINITION AND REQUIREMENTS (continued)

The need for specific design criteria was also considered necessary. FSD contacted 8 potential satellite and payload contractors in an attempt to discuss anticipated fluid requirements by fluid type, operating pressures, mission life, leakage, etc.

Additional background information was obtained by review of orbital servicing studies and other related documents, and attendance at a UCLA short course on Space Shuttle Payload Design and Operation.

The results of all these investigations turned up no available hardware that was considered usable. Only one disconnect supplier responded formally but the unit did not appear to be applicable to the NASA disconnect program. The WESRAC search did not turn up any designs which were directly usable in the intended application, and no specific design requirements were identified by the satellite and payload contractors.

Consequently, during the program review held in November 1976, a decision was made to proceed with a new design utilizing the best features of all concepts investigated to meet a set of generalized fluid requirements. The program structure and schedule were revised to reflect this change in scope.

Appendix I contains a summary of the WESRAC input and output, including abstracts, and a summary of the reports reviewed.

Appendix II contains copies of the letters requesting support from the valve suppliers and payload contractors, with the name and address of those contacted.

3.0 DISCONNECT DESIGN

3.1 Medium Duty Disconnect (NASA Prototype)

Following layout work and design study tradeoffs, a 1/2", 300 psig, disconnect design was presented to MSFC at a preliminary design review held in April 1977. This design features an external swivel with semi-balanced sleeve/poppet which provides relatively low pressure induced separation forces (approximately 1/3 standard unbalanced design), only one close tolerance sealing diameter, relatively short engagement and reasonably low interface volume. Although designed for leakage of 1×10^{-4} sccs helium, MSFC specifically requested that the leakage rates and spillage volume be improved. This request was adopted as a design goal.

This disconnect design is shown in Figure 1 and in Photograph 1. The design requirements are shown in Table III. Fabrication of two test disconnects was started in April 1977 and the first prototype disconnect was delivered for test in July 1977. Simultaneous with fabrication, a detailed development test procedure was prepared and test fixtures built.

The original intent was to use a proprietary TRW material, AF-E-411, for the vent, poppet and sleeve seals. This material is excellent for MMH and other common spacecraft propellants. However, due to the excessive cost for molded seals made of AF-E-411, ethylene propylene rubber (EPR) material was chosen for prototype testing. Neoprene and Teflon seals were also tested.

3.2 Medium Duty Disconnect (JPL)

Discussion with MSFC in April 1978 indicated the need for a medium duty Freon 21 disconnect for use on the 25 KW Power Module. Because considerable modification would be required with the NASA disconnect, another FSD designed disconnect was added to the program. This disconnect was flight qualified by the Jet Propulsion Laboratory (JPL disconnect) and used in the Mariner Space Vehicle. The design of this disconnect with internal swivel offers simplicity and a hard line installation which may make it compatible with the current power module design concept. Minor modification to the hardware and seals compatible with Freon 21 is considered necessary.

The JPL design is shown in Figure 2 and in Photograph 2. The design requirements are shown in Table III.

3.3 Additional Disconnects

In light of the program desire to provide a family of disconnects suitable for a full range of orbital servicing applications, FSD performed conceptual layouts of three additional disconnects. These include a 1/4-inch high pressure (3,000 psig operating pressure) gaseous helium or nitrogen unit and a 1/2-inch cryogenic unit based on the NASA prototype but using a bellows and low temperature seal for fluid containment. Also included was a modification of the NASA prototype designed to have redundant seals for improved reliability. See Figures 3, 4 and 5.

There is no intention at this time to pursue these units due to time and budget constraints. However, it is felt that the preliminary work done supports the concept of a family of simple, reliable, multi-purpose disconnects capable of supporting many varied space servicing applications.

Table III. Design Requirements, NASA Vs. JPL

Description	NASA Disconnect	JPL Disconnect
Application	Flight Interface	Flight Interface
Tube Size	1/2-Inch	1/2-Inch
Type of Disconnect	Breakaway, External Swivel	Breakaway, Internal Swivel
Attachment Method	Flexhose	Hardline
Alignment:		
Offset	.06-Inch	.03-Inch
Angulation	± 5° Conical	± 5° Conical
Operating Fluid	N_2H_4 or MMH Freon 21	Hydrazine, Mono-propellant, Freon 21
Operating Pressure	0-300 psia	0-456 psia
Proof Pressure:		
Mated	440 psig	1650 psig
Unmated	440 psig	930 psig
Burst Pressure:		
Mated	1200 psig	3300 psig
Unmated	1200 psig	1860 psig
Operating Temp:	-50°F to +225°F	+10°F to +150°F
Leakage:		
Mated	1×10^{-4} sccs GHe	1×10^{-3} sccs GHe
Unmated	1×10^{-4} sccs GHe	5 scch GN_2
Flow/Delta P:		
MMH @ 1.1 lbm/sec	28 psid	6.0 psid
Freon 21 @ 3000 lbm/hr	10 psid	3.5 psid
Engagement Force	82 lb_f @ 300 psi	260 lb_f @ 300 psi
Spillage Volume	0.14 ml/cycle	1.0 ml/cycle
Life	500 cycles, 10 years	200 cycles, 2 years
Random Vibration	11.43 GRMS	11.39 GRMS
Weight	2.3 lb max	1.5 lb max

4.0 DEVELOPMENT TESTING

Testing of the first prototype NASA disconnect was started in July 1977 in accordance with Development Test Procedure FR 76300-2 (see Appendix III). The original test plan included the following:

- Examination of Product
- Proof
- Leakage
- Functional
- Flow and Pressure Drop
- Interface Volume
- Life Cycle
- Vibration
- Burst
- Post Test Examination

This test plan was modified as initial testing and program changes dictated. Vibration and burst testing were deleted in an effort to conserve funds and to ensure availability of the disconnects for additional testing, if required. The deletion of these two tests did not affect the overall test results of the units.

The test program was expanded to include Freon 21 testing using different seal materials and to include a leakage test of a new concept of seal that could be applicable to future modifications of the NASA and/or JPL disconnects.

A test fixture was designed and fabricated to allow for automatic or manual operation of the disconnects. This fixture provided a fixed installation for the Space Half Disconnect (SHD) and a two-position installation for the Mission Half Disconnect (MHD). The MHD could be installed so that the two disconnects would be in nominal alignment or with .06-inch offset and ±5° angulation misalignment. A 28 VDC motor and screw drive mechanism was used for engagement and disengagement. Two load cells were installed in the SHD mounting bracket to provide engagement force data.

4.0 DEVELOPMENT TESTING (continued)

A test stand was built to provide gaseous helium, a 28-volt power supply, and control switches. An environmental box was fabricated to permit testing at high and low temperatures. Figures 6 and 7, and Photographs 3, 4 and 5 depict the test setup.

The initial phases of testing disclosed some minor problems of leakage, seal blowout, seal contact on engaging, and seal rollover. These problems were solved by redesign of the interface seal groove, SHD guide, MHD sleeve, seal retainers, and a new SHD poppet spring.

Each test performed is described in detail in the following paragraphs. A summary of the NASA disconnect test results is compared with JPL disconnect test results in Table IV.

> <u>NOTE</u>: The JPL disconnect was not tested under this program due to the cost of fabricating new seals compatible with Freon 21. The design is, however, considered usable for a wide variety of spacecraft servicing missions. The data presented in Table IV is from prior qualification tests.

4.1 <u>Examination of Product</u>

Prior to initiation of development testing, the disconnects were examined and weighed. No non-conformities with the applicable drawings were noted. The weight of the SHD was 1.03 pounds and the weight of the MHD was 1.21 pounds.

4.2 <u>Proof Pressure</u>

The disconnects were installed in the test fixture in the unmated condition and each unit was separately pressurized to 440 psig with GN_2 for a period of 5 minutes. Visual inspection showed no permanent deformation.

The disconnects were then fully engaged and pressurized to 440 psig with GN_2 for a period of 5 minutes. Visual inspection showed no permanent deformation.

Table IV. Test Results

Description	NASA Disconnect	JPL Disconnect
Test Status	In Development	Qualified
Proof	No distortion or failure	No distortion or failure
Leakage	See Table V	See Table VI
Flow/ P	See Figure 11	8.1 psid @ 1.1 lb/sec
Spillage Volume	0.26 cc/cycle	0.68 cc/cycle
Engagement Force	56 lb_f @ 300 psig	375 lb_f @ 465 psig
Vibration	N/A	11.4 GRMS
Pyrotechnic Shock	N/A	8500 G' Peak
Misalign Disengagement	No sticking or binding	20 lb_f max - no sticking or binding
Contamination	N/A	No failures or damage
Life Cycle	No problems during 200 cycles	No problems during 200 cycles @ +151°F and 200 cycles @ +9°F
Burst	N/A	No failures @ 1860 psig unmated and 3300 psig mated
Weight	1.03 lb (SHD) 1.21 lb (MHD)	0.65 lb (Propulsion Module) 0.46 lb (Mission Module)

4.3 Leakage

Individual disconnect half leakage rates were determined with the unit installed in the test fixture in the unmated condition. Special leakage collection test fixtures were used to isolate SHD poppet seal leakage, MHD sleeve seal leakage, and MHD interface seal leakage.

Various leakage measuring devices were used depending on the media and leakage rate and included a mass spectrometer, halogen leakage detector, water displacement, and flowmeters.

Figure 8 shows a typical setup for mass spectrometer leakage tests.

Mated leakage tests were conducted with the units installed in the test fixture and a rubber bladder installed over the mated disconnects to collect leakage.

In all cases, the test fixture was placed in an environmental box which allowed testing to be performed at temperatures between -50°F and +225°F. Following leakage tests conducted at ambient temperature, tests were performed at +125°F, +175°F, and +225°F. Low temperature tests were performed at +50°F, +25°F, 0°F, -25°F and -50°F. Leak test pressures were 50, 150 and 300 psig at high and low temperature, and 50 to 300 psig at 50 psig intervals at ambient temperature.

Using EPR seals, helium leakage results for the unmated SHD, the unmated MHD, and the mated SHD/MHD ranged from 2.4×10^{-4} sccs to 2.6×10^{-10} sccs over the entire pressure and temperature range. See Table V for a complete summary of leakage test results. Table VI provides leakage data for the JPL disconnect for comparison purposes.

4.4 Functional Testing

Functional testing was performed to determine any indication of jamming or binding of the disconnects during engagement or disengagement and to determine the engagement force required. This test was performed in both the aligned and misaligned position with internal pressures of 0 to 300 psig at ambient temperature.

There was no indication of binding or jamming during engagement and disengagement under either the aligned or misaligned condition. The maximum engagement force with the MHD pressurized to 300 psig was 56 pounds. See Figure 9.

Table V. Leakage Characteristics - NASA Disconnect
Leakage in Sccs of Helium (EPR Seals)

Unmated - Module Half Disconnect

Pressure (psig)	R.T.	+50°F	+25°F	0°F	-25°F	-50°F
50	7.2×10^{-6}	1.0×10^{-7}	6×10^{-8}	2.6×10^{-10}	2.6×10^{-7}	1.3×10^{-8}
100	1.2×10^{-6}	1.2×10^{-7}	6×10^{-8}	2.6×10^{-10}	2.6×10^{-7}	1.3×10^{-8}
150	2.2×10^{-6}	2.7×10^{-7}	6×10^{-8}	2.6×10^{-10}	2.6×10^{-7}	1.3×10^{-8}
200	3.4×10^{-6}	9.0×10^{-7}	6×10^{-8}	2.6×10^{-10}	2.6×10^{-7}	1.3×10^{-8}
250	6.4×10^{-6}	9.0×10^{-7}	6×10^{-8}	2.6×10^{-10}	2.6×10^{-7}	1.3×10^{-8}
300	8.5×10^{-6}	1.1×10^{-6}	6×10^{-8}	2.6×10^{-10}	2.6×10^{-7}	1.3×10^{-8}

	R.T.	+125°F	+175°F
50	3.3×10^{-6}	9.8×10^{-6}	3.2×10^{-6}
100	3.3×10^{-6}	9.8×10^{-6}	3.2×10^{-6}
150	3.3×10^{-6}	9.8×10^{-6}	3.2×10^{-6}
200	3.3×10^{-6}	9.8×10^{-6}	3.2×10^{-6}
250	3.3×10^{-6}	9.8×10^{-6}	3.2×10^{-6}
300	3.3×10^{-6}	9.8×10^{-6}	3.2×10^{-6}

Mated - Space Half Disconnect & Module Half Disconnect

Pressure (psig)	R.T.	+50°F	+25°F	0°F	-25°F	-50°F
50	1.6×10^{-8}	4×10^{-7}	0	2.0×10^{-8}	0	0
100	2.4×10^{-8}	4×10^{-7}	1.2×10^{-8}	2.0×10^{-8}	2.0×10^{-8}	0
150	4.4×10^{-8}	4×10^{-7}	8.0×10^{-8}	4.0×10^{-8}	4.0×10^{-8}	2.0×10^{-8}
200	4.8×10^{-8}	4×10^{-7}	1.2×10^{-8}	6.0×10^{-8}	6.0×10^{-8}	4.0×10^{-8}
250	8.0×10^{-8}	4×10^{-7}	1.2×10^{-8}	6.0×10^{-8}	8.0×10^{-8}	4.0×10^{-8}
300	1.1×10^{-7}	4×10^{-7}	1.6×10^{-8}	8.0×10^{-8}	8.0×10^{-8}	8.0×10^{-8}

Table V. Leakage Characteristics - NASA Disconnect Leakage in Sccs of Helium (continued)

Mated - Space Half Disconnect & Module Half Disconnect (continued)

Pressure (psig)	R.T.	+122°F	+175°F	+225°F	R.T.
50	1.27×10^{-7}	1.7×10^{-7}	4×10^{-7}	6.4×10^{-7}	4.2×10^{-7}
100	1.27×10^{-7}	1.7×10^{-7}	4×10^{-7}	6.4×10^{-7}	4.2×10^{-7}
150	1.27×10^{-7}	1.7×10^{-7}	4×10^{-7}	6.4×10^{-7}	4.2×10^{-7}
200	1.27×10^{-7}	1.7×10^{-7}	4×10^{-7}	6.4×10^{-7}	4.2×10^{-7}
250	1.27×10^{-7}	1.7×10^{-7}	4×10^{-7}	6.4×10^{-7}	4.2×10^{-7}
300	1.27×10^{-7}	1.7×10^{-7}	4×10^{-7}	6.4×10^{-7}	4.2×10^{-7}

Unmated - Space Half Disconnect

Pressure (psig)	R.T.	+50°F	+25°F	0°F	-25°F	-50°F
50	0	1.1×10^{-6}	2.4×10^{-7}	4.6×10^{-8}	-	1.3×10^{-6}
100	2.3×10^{-7}	-	-	-	-	8.1×10^{-5}
150	4.6×10^{-7}	-	4.0×10^{-7}	2.5×10^{-7}	5.4×10^{-7}	8.1×10^{-5}
200	6.9×10^{-7}	-	-	-	-	8.1×10^{-3}
250	1.6×10^{-6}	-	-	-	-	8.1×10^{-3}
300	2.5×10^{-6}	-	1.0×10^{-5}	2.0×10^{-7}	1.9×10^{-6}	8.1×10^{-3}

	R.T.	+122°F	+175°F	+225°F	R.T.
50	3×10^{-7}	5.1×10^{-7}	1.3×10^{-6}	6×10^{-6}	3.4×10^{-6}
100	-	-	-	-	-
150	2.6×10^{-4}	-	1.5×10^{-6}	5.5×10^{-5}	2.4×10^{-7}
200	-	-	-	-	-
250	-	-	-	-	-
300	2.6×10^{-4}	-	3.6×10^{-6}	5.5×10^{-5}	5.2×10^{-7}

LEAKAGE IN SCCS OF FREON 21

Seal Material	EPR	Neoprene	Teflon
Leak Pressure (psig)	50-300	50-300	50-300
Leakage (sccs F-21)	2×10^{-5} to 1×10^{-7}	1×10^{-5} to 1×10^{-7}	1×10^{-3} to 3×10^{-5}

Table VI. Leakage Characteristics (During Qual) - JPL Disconnect - Leakage in Sccs of Helium

Mated (Out-to-In)	Post Vibration	Post Shock	Post 200 Cycles @+151°F	Post 200 Cycles @+9°F	Post Flow & Contamination
14.7 psia	3.6×10^{-6}	-	-	-	7.6×10^{-7}
Mated (In-to-Out)					
5 psig	1.6×10^{-5}	4.8×10^{-6}	2.6×10^{-6}	1.9×10^{-5}	5.6×10^{-6}
40 psig	1.9×10^{-5}	4.1×10^{-6}	1.1×10^{-5}	1.1×10^{-5}	2.2×10^{-6}
465 psig	1.38×10^{-4}	1.8×10^{-5}	3×10^{-5}	1.1×10^{-5}	4.6×10^{-7}
Unmated (Worst Case) Propulsion Half					
5 psig	2.5×10^{-4}	1.7×10^{-4}	1.7×10^{-5}	2.9×10^{-4}	1.7×10^{-4}
40 psig	3.3×10^{-4}	1.7×10^{-4}	1.7×10^{-5}	3.3×10^{-4}	3.2×10^{-5}
465 psig	3.3×10^{-5}	3.3×10^{-5}	4.6×10^{-4}	1.6×10^{-5}	3.2×10^{-5}
Mission Half					
5 psig	3.3×10^{-5}	1.7×10^{-4}	1.1×10^{-6}	3.3×10^{-5}	1.7×10^{-4}
40 psig	3.3×10^{-5}	1.7×10^{-4}	1.7×10^{-6}	3.3×10^{-5}	3.2×10^{-5}
465 psig	4.6×10^{-5}	3.3×10^{-5}	3.8×10^{-5}	7.4×10^{-4}	3.2×10^{-5}

4.5 Flow and Pressure Drop

The disconnects were installed in the test fixture in the mated condition and placed in the flow test facility as shown in Figure 10 and Photographs 6 and 7.

The water reservoir was pressurized to between 100 and 200 psig and flow through the mated disconnects was gradually increased over the flow range of 1 to 20 GPM. Pressure drop was measured across the disconnects and correlated with the flowrate as measured by a turbine flowmeter. The test was performed with the disconnects mated in both the minimum and maximum separation positions. In addition, a third run was made with the disconnects removed and a 1/2-inch diameter straight tube installed to obtain a system tare. The tare ΔP was subtracted from the disconnect ΔP to get the net ΔP induced by the disconnects for water. This data was then corrected to provide equivalent data for MMH and Freon 21. Figure 11 is a plot of ΔP vs flowrate for water, MMH and Freon 21.

4.6 Interface Volume

The disconnects were installed in the test fixture in the mated position and connected to a water supply as shown in Figure 12. All air was bled from the disconnects and the water supply pressurized to 300 psig. Using the automatic cycling mode, the units were disengaged and engaged 100 times. Water spilled from the interface and SHD vent port was collected and measured.

After 100 cycles, a total of 25.7 cc was collected from the interface, and 0.2 cc from the SHD vent port. This corresponds to a total of 0.26 cc/cycle.

4.7 Life Cycle

The disconnects were installed in the test fixture and subjected to 100 automatic cycles at ambient temperature with the MHD pressurized to 300 psig and the SHD pressurized to 0 psig. A second 100 automatic cycles were performed with the MHD pressurized to 300 psig and the SHD pressurized to 150 psig. Mated and unmated leakage tests were performed before and after each 100-cycle test.

During this phase of testing, two problems were noted; (1) the MHD poppet seal started to move forward and cause excessive interface leakage, and (2) excessive SHD vent leakage occurred during disengagement.

4.7 Life Cycle (continued)

The MHD poppet seal retainer was modified to increase the squeeze on the seal and the SHD poppet spring preload was increased.

The ambient life cycle test was repeated with no recurrence of leakage or excessive venting. All leakage test results were acceptable (much less than 1×10^{-4} sccs helium).

Life cycle testing at high and low temperatures was not performed due to problems with the test fixture motor and screw drive mechanism. However, leakage tests were performed successfully at the high and low temperature conditions.

4.8 Freon 21 Testing

Following the decision to investigate the possible use of the NASA disconnect in Freon 21 systems, a review of possible seal materials was performed. Technical data indicated that the existing EPR seals were rated unsatisfactory and Neoprene was rated fair for use with Freon 21. Although both materials will exhibit swelling, EPR tends to disintegrate much sooner under long-term storage. Neoprene was therefore chosen as the most likely seal material to perform over the full temperature range, but Teflon was also chosen as a good candidate for the lower temperatures. Testing with Freon 21 was performed on all three seal materials.

The disconnects were placed in the test fixture and connected to a Freon 21 supply as shown in Figure 13 and Photograph 8.

Freon 21 at ambient temperature was applied to the mated disconnects over a pressure range of 50 to 300 psig and allowed to sit over periods of time that varied from 2 to 72 hours.

Leakage was measured by water displacement and/or a halogen leak detector and leakage results for seals of Neoprene, EPR and Teflon are summarized in Table V.

Analysis of the test results for each of the three seal materials revealed the following:

a. O-rings of both Neoprene and EPR showed signs of swelling but neither showed evidence of damage or caused failure of proper disconnect operation.

4.8 Freon 21 Testing (continued)

b. Molded Neoprene seals swelled excessively, resulting in tearing of the seal and/or jamming of the poppets during engagement or disengagement. All molded seals (MHD poppet seal, MHD sleeve seal, and SHD poppet seal) were destroyed. Leakage rates ranged from 10^{-5} to 10^{-7} sccs, but are questionable due to swelling. See Photographs 9 through 13.

c. Molded EPR seals swelled but did not tear or cause jamming of the poppet. Test time in Freon 21 was not long enough to determine degradation of seal physical characteristics and no disintegration was noted. Leakage rates ranged from 10^{-5} to 10^{-7} sccs He, but are questionable due to swelling. See Photograph 14.

d. Teflon seals showed no evidence of swelling or degradation. Leakage rates ranged from 10^{-3} to 10^{-5} sccs He.

4.9 Special Seal Leakage Test

Molded seals of Neoprene may be used in Freon 21 systems if proper containment and volume for the expected swelling is considered. Since it was impractical to modify the NASA disconnect at this point in the development program, an effort was made to identify and perform preliminary testing on a new Freon 21 seal design.

Several modifications to the disconnects were considered after discussions with seal manufacturers and one promising design was chosen. Sample seals of a spring loaded, Teflon jacketed, pressure loaded seal (PLS) design were purchased and a simple test fixture designed and built.

The test fixture was installed in the test setup as shown in Figure 14 and Photograph 15. The PLS was subjected to helium leakage tests over the pressure range of 50 to 300 psig and temperatures ranging from -150°F to +225°F.

Results indicated acceptable leakage rates under all conditions above -50°F. Leakage rates below -50°F were in the range of 10^{-2} sccs of helium. See Table VII for a complete summary of test results. This seal should be considered a candidate for future development.

4.10 Post Test Inspection

The SHD, MHD and special seal test fixture were disassembled and visually inspected following completion of the development test program. No evidence of contamination, distorion, or abnormal wear was noted. See Photographs 16, 17 and 18.

Table VII. NASA Special Seal Test (PLS)

Pressure (psig)	SCCS HELIUM LEAKAGE 0	50	100	150	200	250	300	Back-ground
Temperature (°F)								
Ambient	-	∅	∅	∅	∅	∅	∅	-
After 50 cycles @ 100 psig	-	∅	∅	$1x10^{-5}$	$1.8x10^{-5}$	$2x10^{-5}$	$2.2x10^{-5}$	$2x10^{-5}$
After 50 cycles @ 200 psig	-	∅	$4x10^{-6}$	$1x10^{-5}$	$1x10^{-5}$	$2x10^{-5}$	$3x10^{-5}$	$1x10^{-5}$
After 50 cycles @ 300 psig	-	∅	∅	∅	∅	∅	$4x10^{-6}$	$2x10^{-5}$
Ambient	-	∅	∅	∅	∅	∅	∅	-
+125	-	$6x10^{-6}$	$2.8x10^{-5}$	$4x10^{-5}$	$4.8x10^{-5}$	$5.8x10^{-5}$	$7x10^{-5}$	$2x10^{-5}$
+175	-	∅	$6x10^{-6}$	$2.6x10^{-5}$	$6.6x10^{-5}$	$1.1x10^{-4}$	$1.9x10^{-4}$	$9.4x10^{-5}$
+225	-	∅	∅	∅	$2x10^{-5}$	$9x10^{-5}$	$2x10^{-4}$	$1.6x10^{-4}$
Ambient	-	∅	∅	∅	o	∅	$6x10^{-6}$	-
+125 (with 100 psig on part)	-	-	-	∅	∅	$6x10^{-6}$	$8x10^{-6}$	$5x10^{-5}$
+175 (with 100 psig on part)	-	-	-	∅	∅	$3x10^{-5}$	$8x10^{-5}$	$1.2x10^{-4}$
+225 (with 100 psig on part)	-	-	-	∅	$1.1x10^{-4}$	$2.3x10^{-4}$	$3.3x10^{-4}$	$1.5x10^{-4}$
Ambient	-	∅	∅	∅	∅	$4x10^{-6}$	$1x10^{-5}$	$1x10^{-5}$

Table VII. NASA Special Seal Test (PLS) (continued)

Pressure (psig)	SCCS HELIUM LEAKAGE 0	50	100	150	200	250	300	Back-ground
Temperature (°F)								
50°	-	$1x10^{-5}$	$2x10^{-5}$	$5.5x10^{-5}$	$4x10^{-5}$	$3x10^{-5}$	$2.6x10^{-5}$	-
25°	-	$1.4x10^{-4}$	$2.4x10^{-4}$	$4.5x10^{-4}$	$1.4x10^{-4}$	$8.5x10^{-5}$	$6.5x10^{-5}$	$1.5x10^{-5}$
0°	-	$8x10^{-5}$	$2.6x10^{-4}$	$4.2x10^{-4}$	$1.6x10^{-4}$	$1.1x10^{-4}$	$5x10^{-5}$	$2x10^{-5}$
-25°	-	$9x10^{-5}$	$2.1x10^{-4}$	$3.8x10^{-4}$	$2x10^{-5}$	$1x10^{-5}$	$2x10^{-5}$	$2x10^{-5}$
-50°	-	$1x10^{-4}$	$2.7x10^{-4}$	$3.2x10^{-4}$	$1.8x10^{-4}$	$2.8x10^{-5}$	$2x10^{-5}$	$2x10^{-5}$
-100°	-	*	*	*	*	*	*	*
-150°	-	$2.9x10^{-2}$	$1.5x10^{-2}$	$1.5x10^{-2}$	$2x10^{-2}$	$2x10^{-2}$	$2.5x10^{-2}$	$2x10^{-4}$
Part pressurized to 100 psig as temperature reduced								
Ambient	-	ø	ø	ø	ø	ø	ø	$8x10^{-5}$
50°	-	-	-	$3x10^{-6}$	ø	ø	ø	$4.4x10^{-5}$
25°	-	-	-	ø	ø	ø	ø	$3.6x10^{-5}$
0°	-	-	-	ø	ø	ø	ø	$2.8x10^{-5}$
-25°	-	-	-	ø	ø	ø	ø	$2.6x10^{-5}$
-50°	-	-	-	ø	ø	ø	ø	$2x10^{-5}$
-100°	-	-	-	$7x10^{-3}$	$3.2x10^{-2}$	$5.8x10^{-2}$	$8.8x10^{-2}$	$2x10^{-3}$
-150°		-	-	$5.4x10^{-2}$	$1.4x10^{-2}$	$1.5x10^{-2}$	$1.8x10^{-2}$	$1.6x10^{-2}$

* data erratic on all 10^{-2} scale.

5.0 MARTIN DEMONSTRATION

In February 1978, FSD installed the backup prototype NASA disconnect on the Martin Marietta (Denver) Module Exchange Mechamism (MEM) for demonstration to NASA headquarters personnel. Martin was performing studies on satellite servicing using a module exchange system. At the request of MSFC, FSD and Martin cooperated in adapting the NASA disconnect to the MEM to demonstrate the feasibility of fluid exchange. The disconnects were pressurized and instrumentation provided a visual indication of proper engagement when the MEM exchanged modules between a simulated spacecraft and on-orbit servicer. See Figure 15 and Photographs 19 through 23.

This demonstration successfully verified the self alignment capability and low engagement force necessary for remote spacecraft servicing operations and that fluid transfer between spacecraft is feasible.

FSD permanently installed the second NASA prototype disconnect on the Martin MEM following delivery of the mechanism to MSFC for future demonstration and evaluation.

6.0 FUTURE USAGE

As part of the NASA disconnect program, FSD agreed to assist MSFC in identification of potential users and applications for the NASA disconnect. Twenty-one potential users were contacted by letter explaining the program and soliciting help in defining potential uses and requirements. Responses led to several meetings where information was exchanged, although no specific environmental or design requirements were identified. Companies interested were Martin Marietta, Beach Boulder, Ball Brothers, Lockheed Sunnyvale, TRW, McDonnell Douglas, Vought, and the U.S. Navy.

7.0 NEW TECHNOLOGY UTILIZATION

There were no reportable items as defined under the New Technology Utilization Program discovered during this contract.

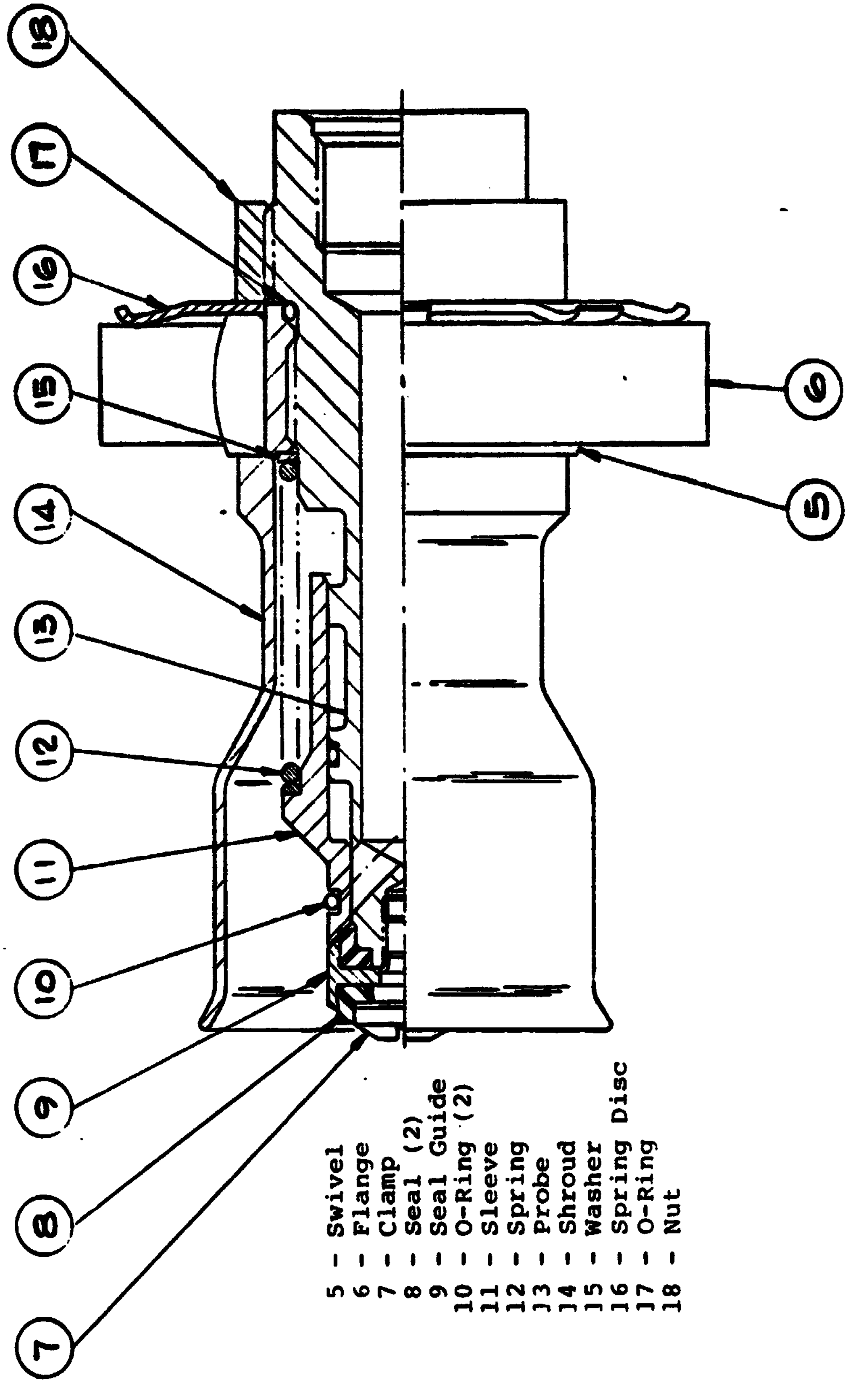

Figure 1a. NASA Prototype Disconnect, Module Half Disconnect (MHD), P/N 76300000-101

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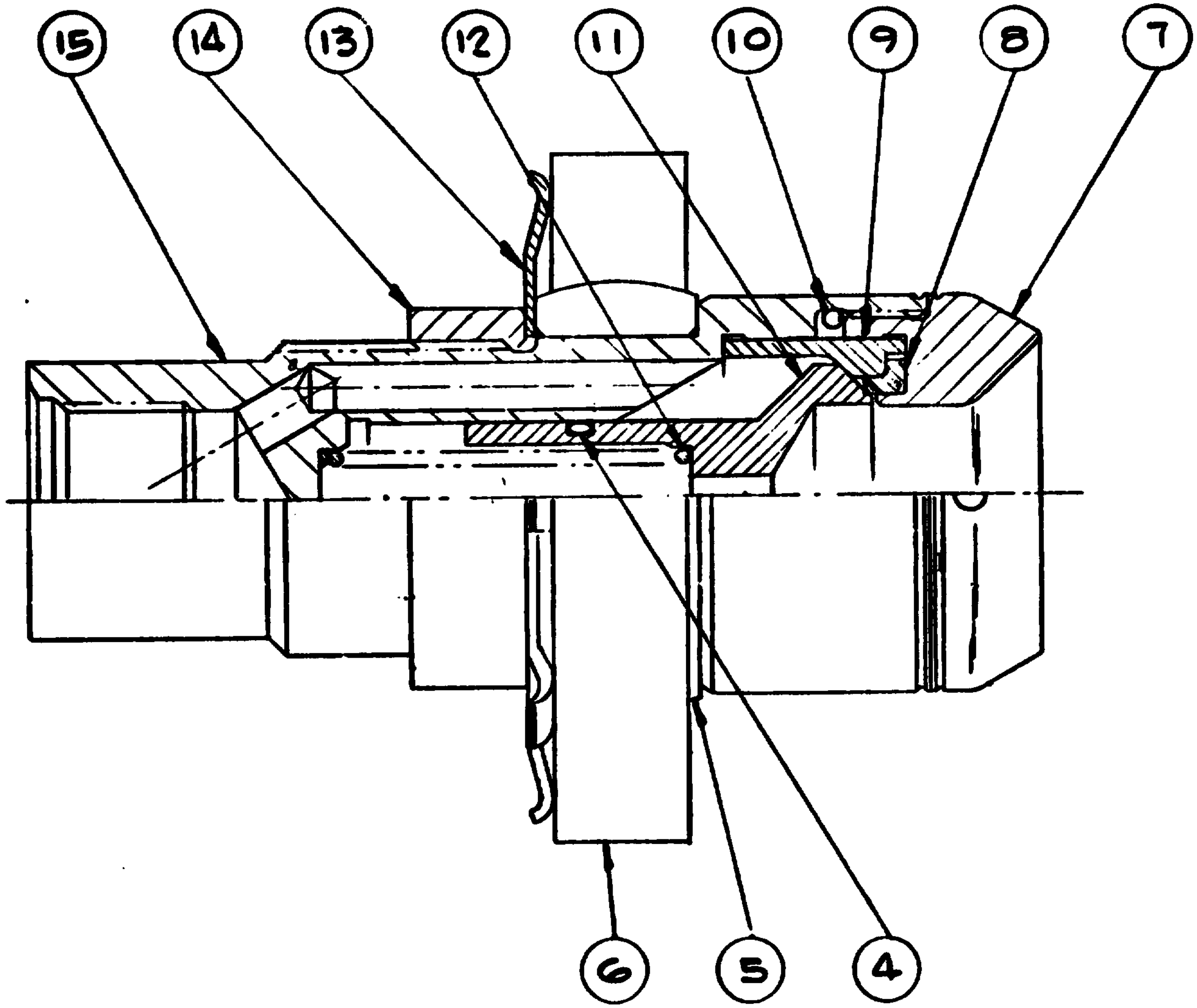

4 - O-Ring
5 - Swivel
6 - Flange
7 - Guide
8 - Seal
9 - Retainer
10 - O-Ring
11 - Poppet
12 - Spring
13 - Spring Disc
14 - Nut
15 - Housing

Figure 1b. NASA Prototype Disconnect, Spacecraft Half Disconnect (SHD), P/N 76300100-101

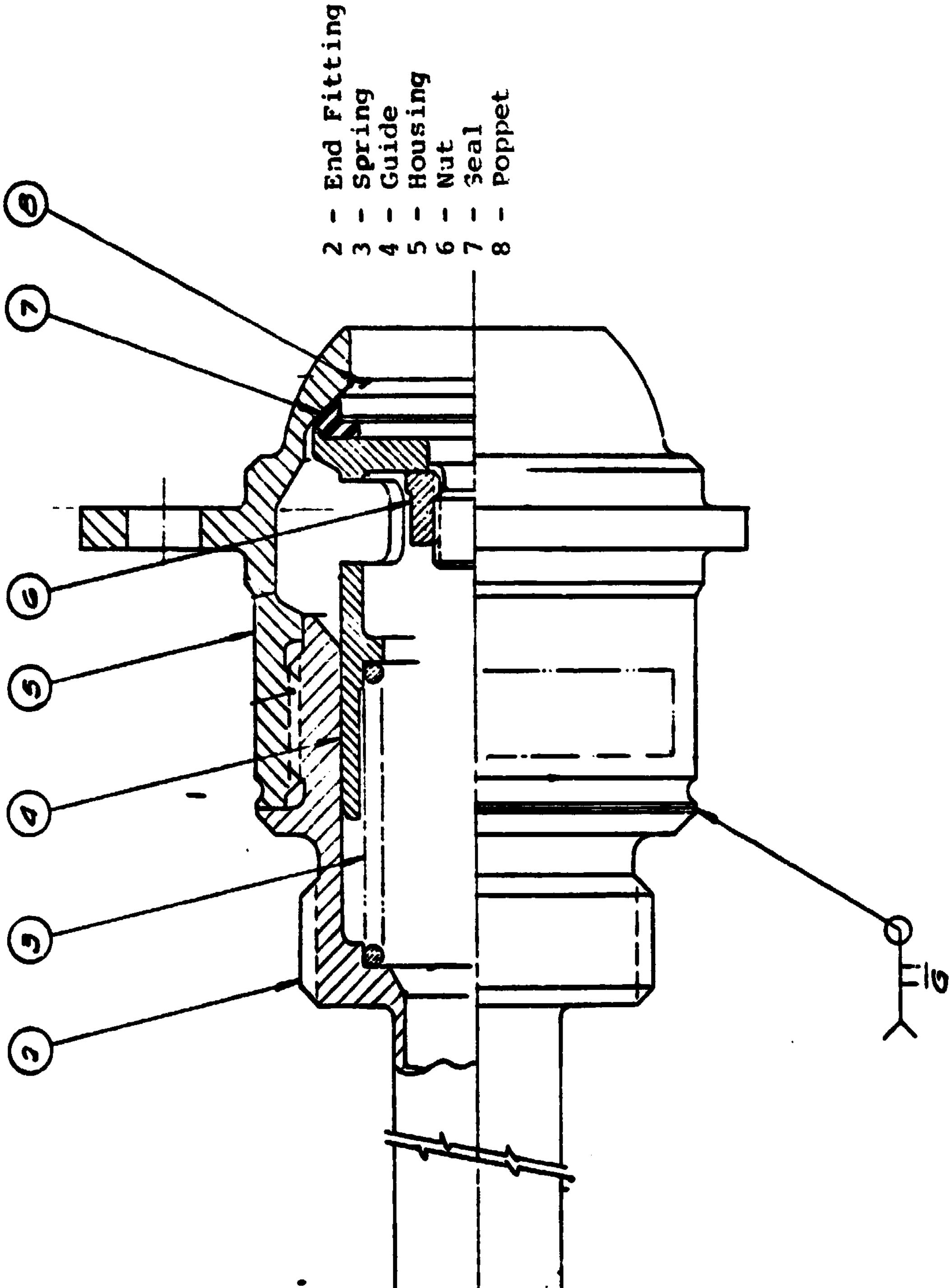

Figure 2a. JPL Disconnect - Mission Module Half (MMH), P/N 74367000-101

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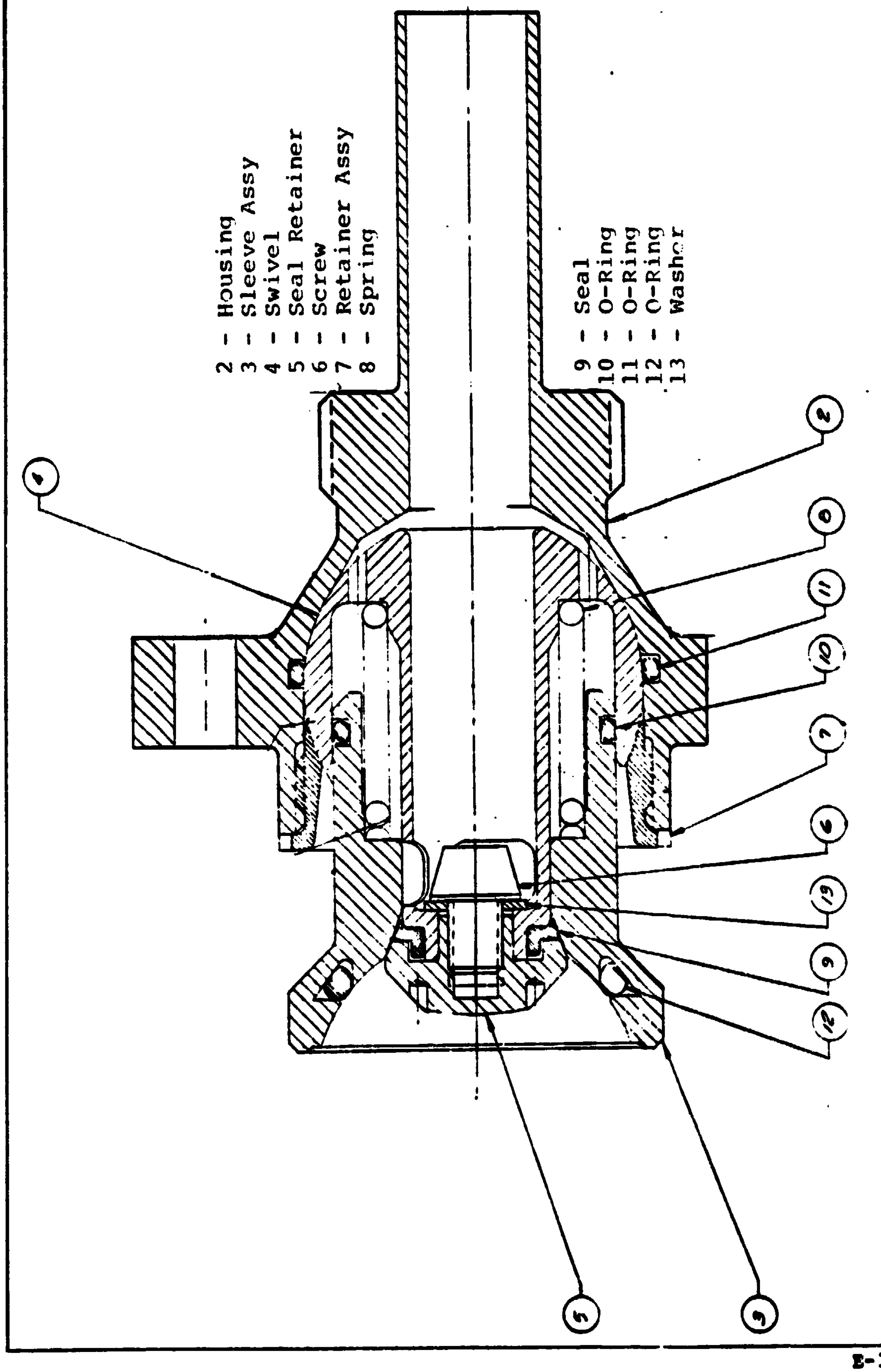

Figure 2b. JPL Disconnect - Propulsion Module Half (PMH), P/N 74366000-101

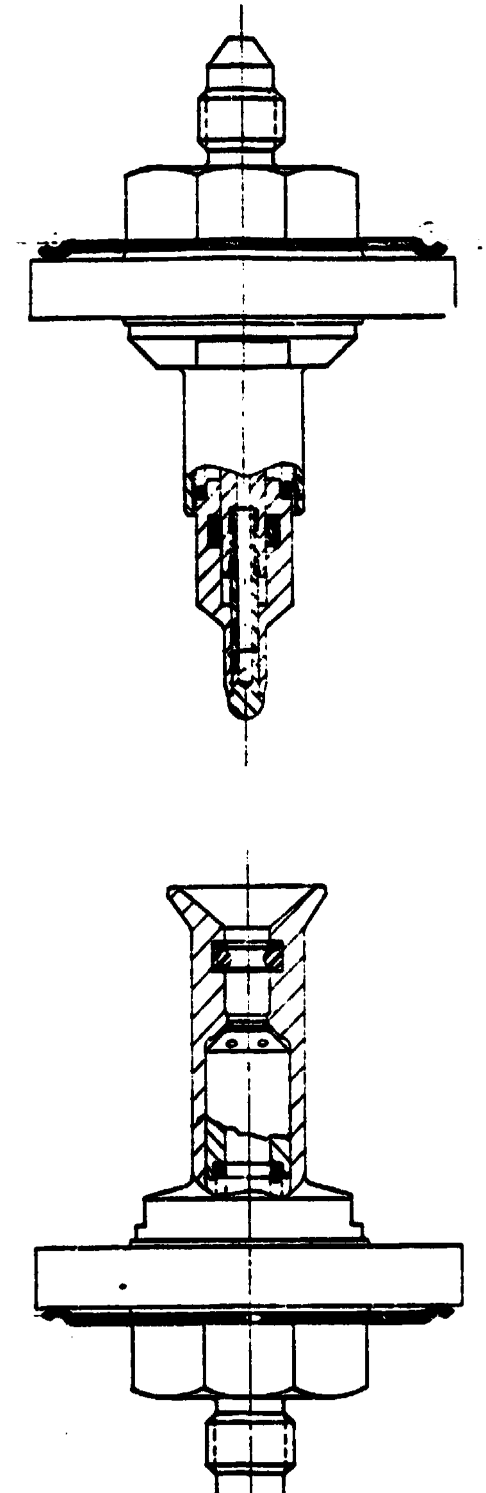

Figure 3. High Pressure Disconnect

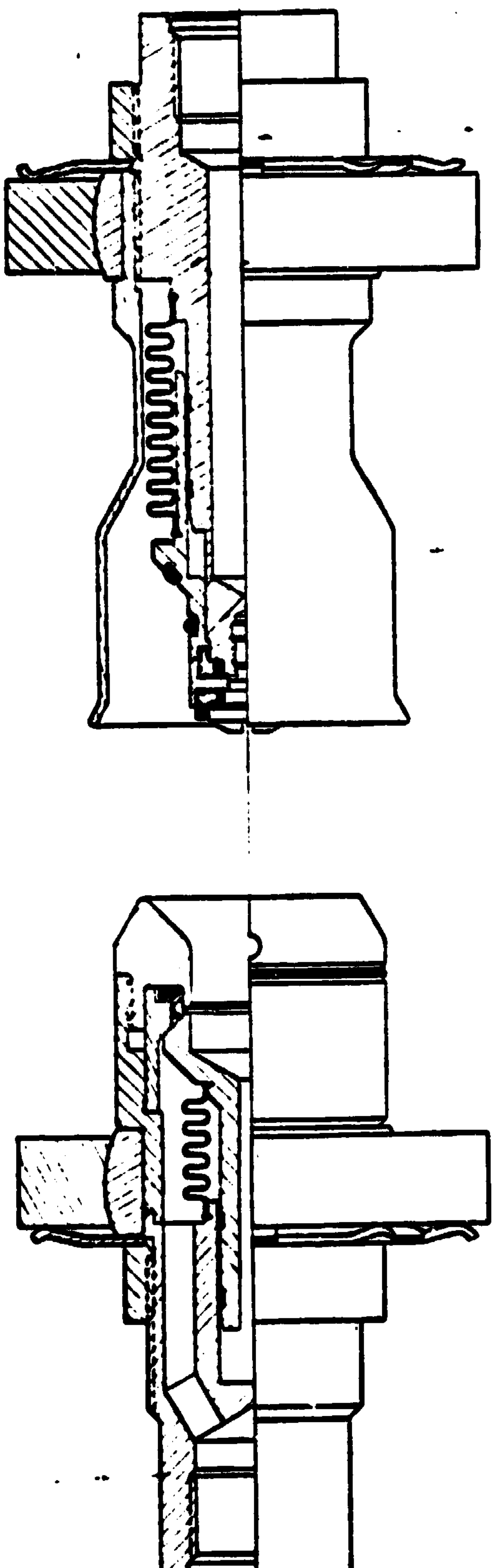

Figure 4. Cryogenic Disconnect

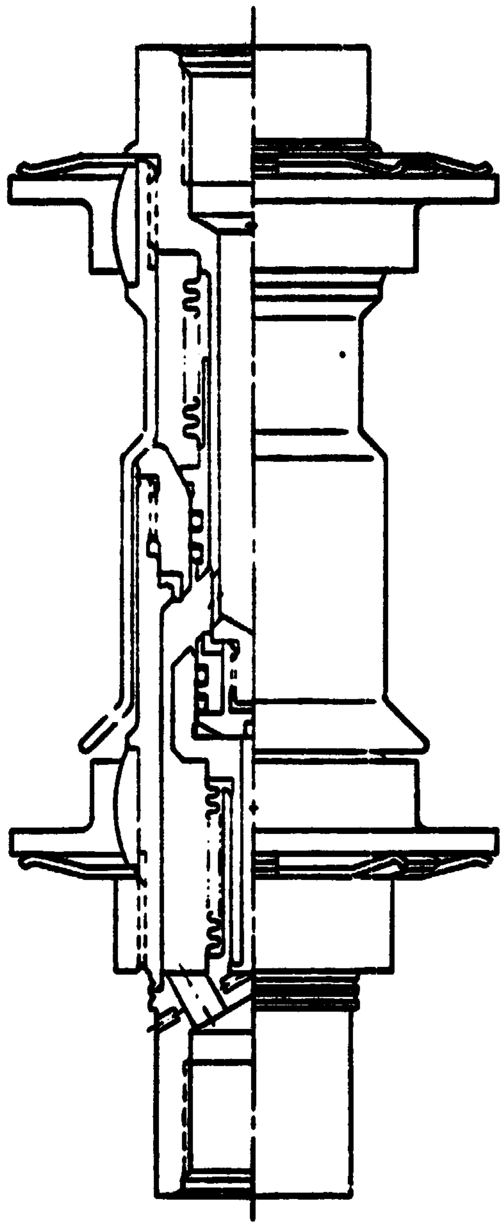

Figure 5. Redundant Seal Disconnect

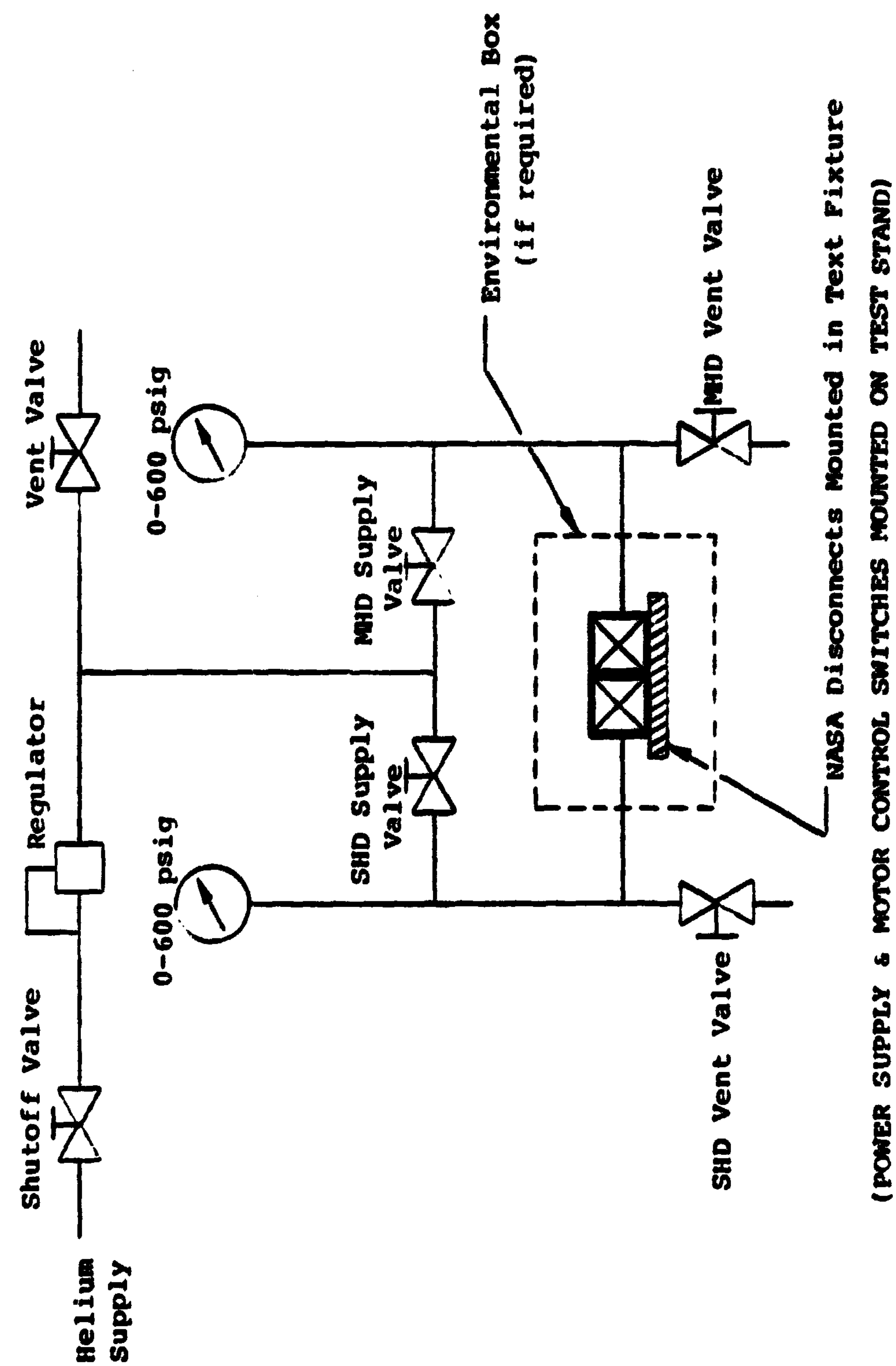

Figure 6. Proof, Leakage, Functional and Cycling Test Setup Schematic

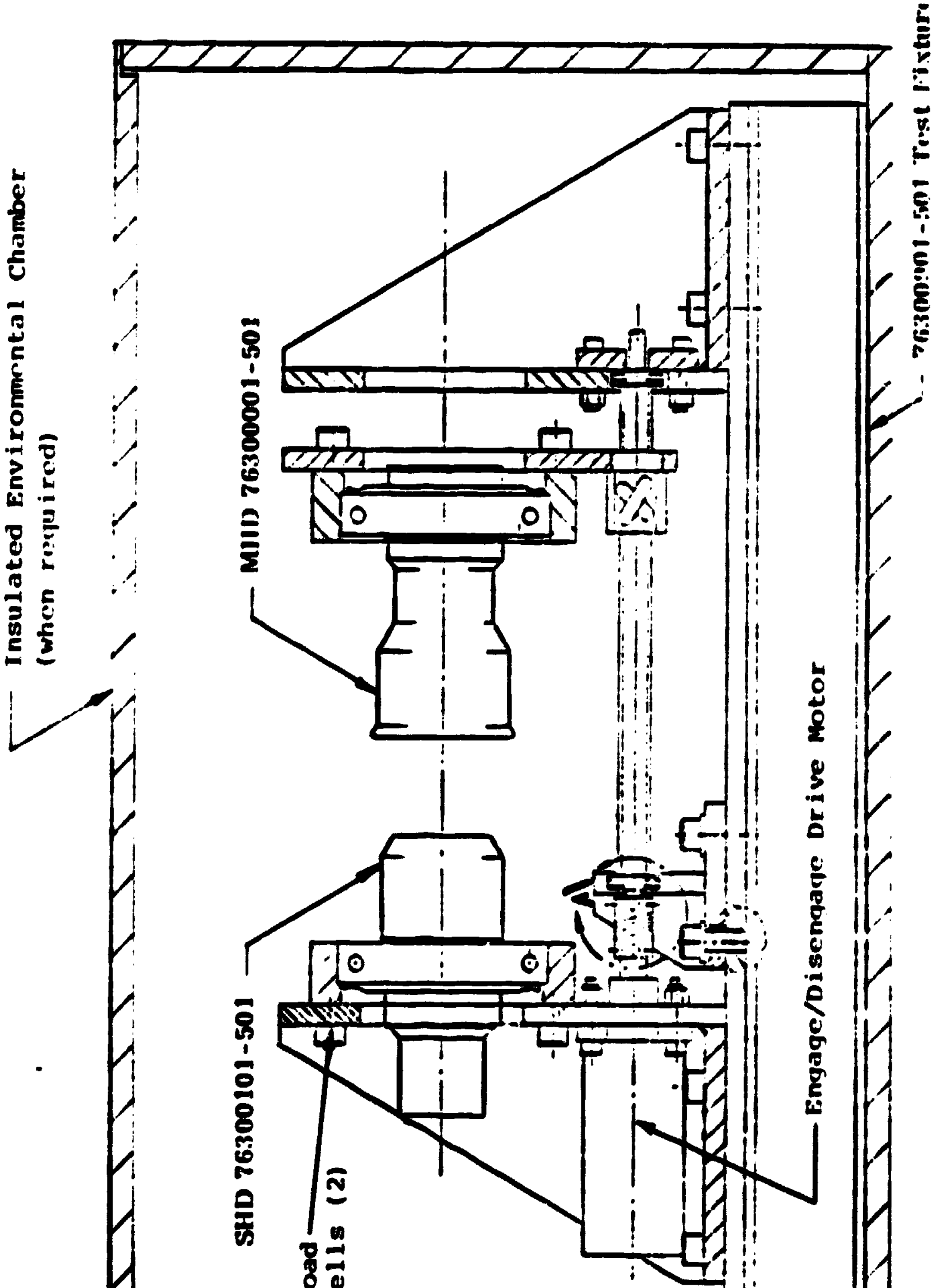

Figure 7. Environmental Test Fixture

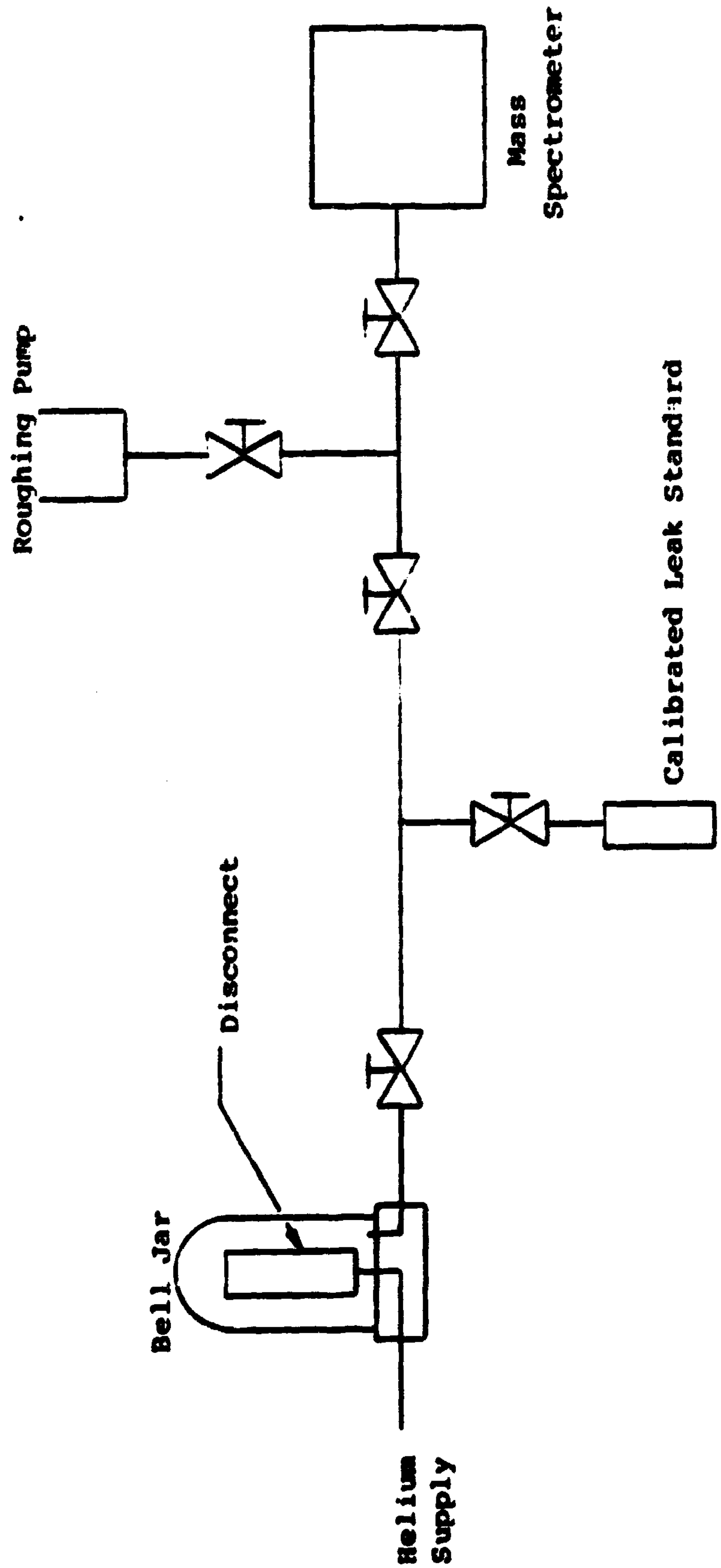

Figure 8. Mass Spectrometer Leak Test Setup Schematic

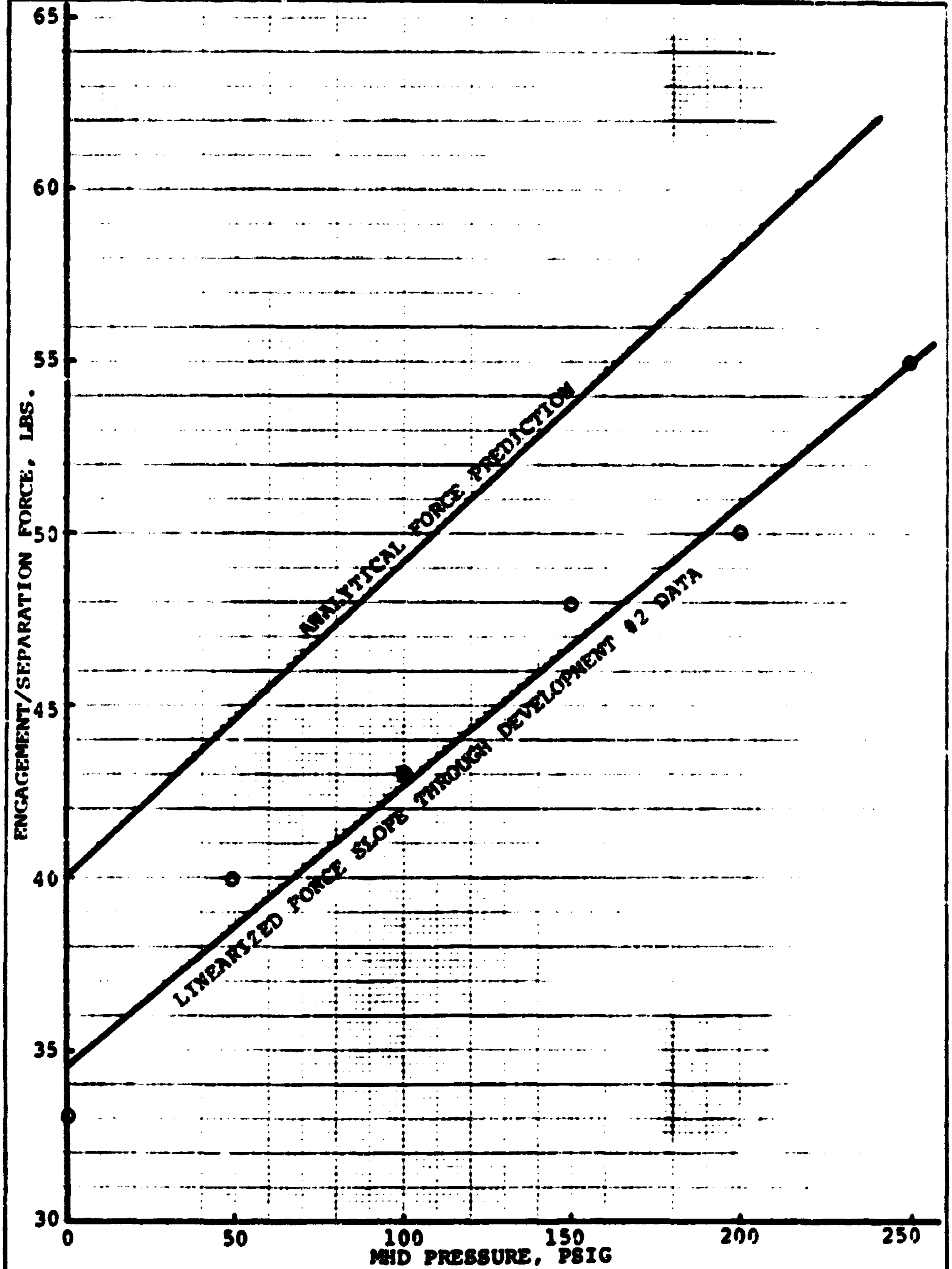

Figure 9. NASA Disconnect Engagement/Separation Forces

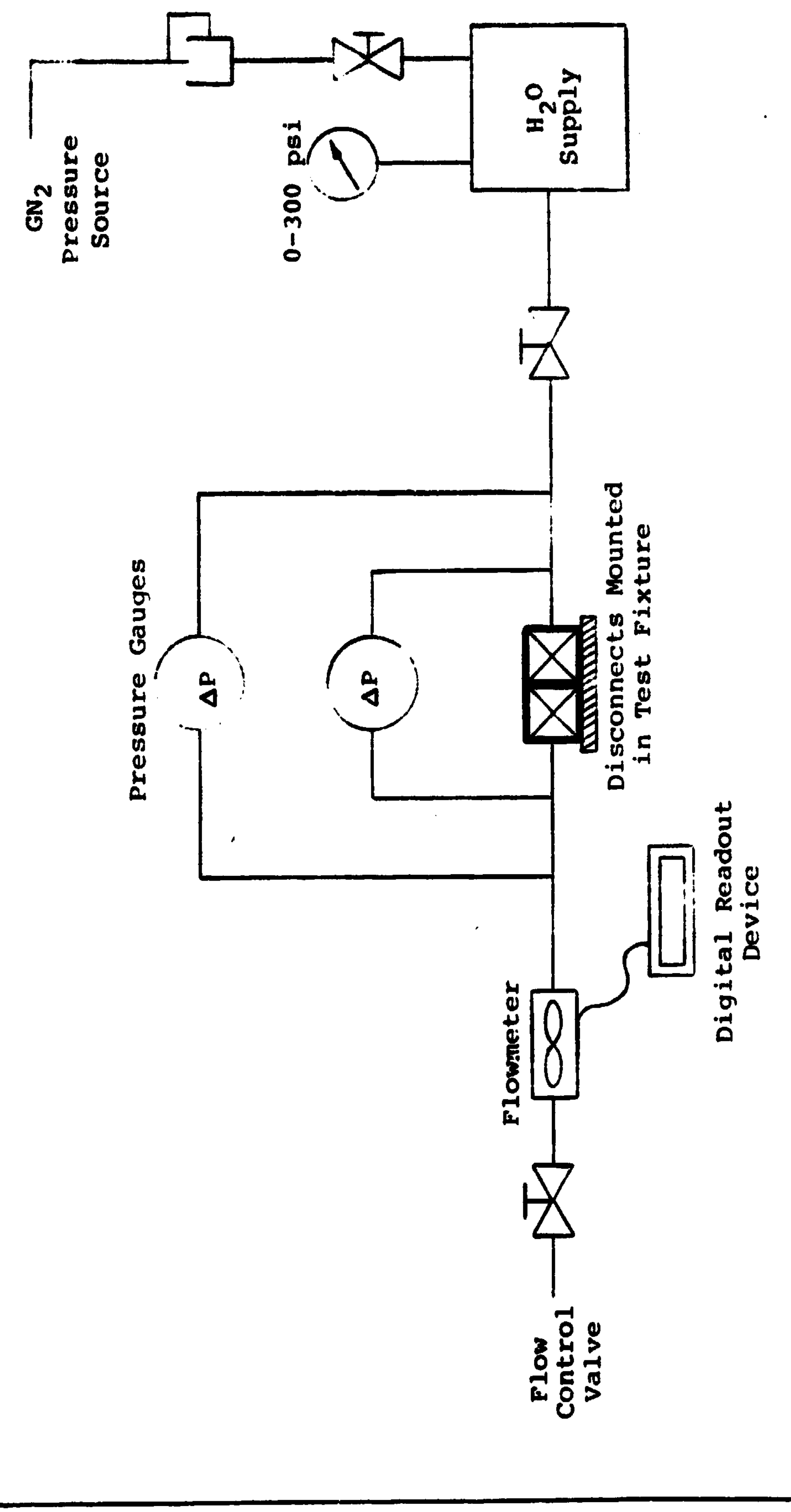

Figure 10. Flow/ΔP Test Setup Schematic

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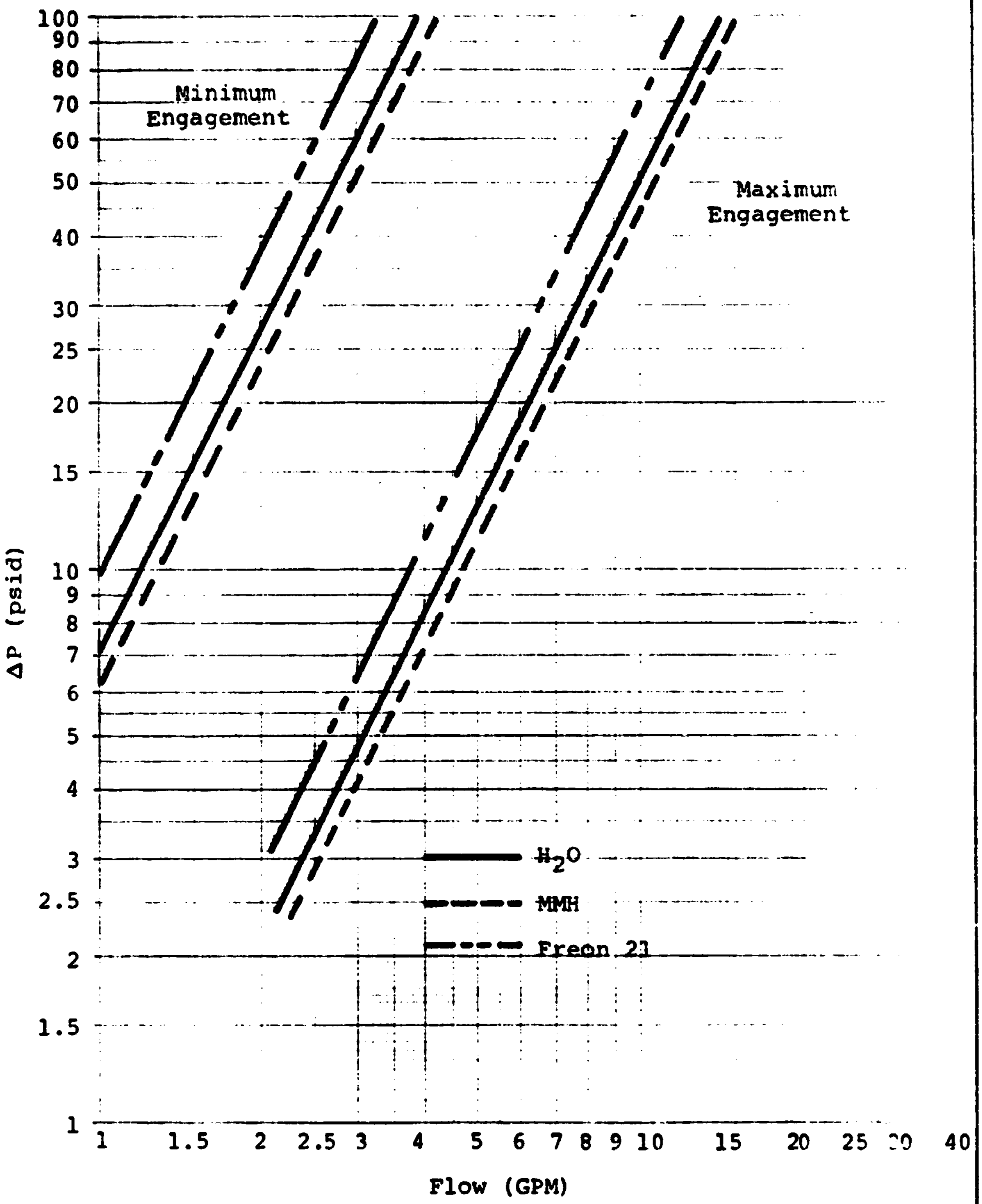


Figure 11. NASA Disconnect, Flow/ΔP

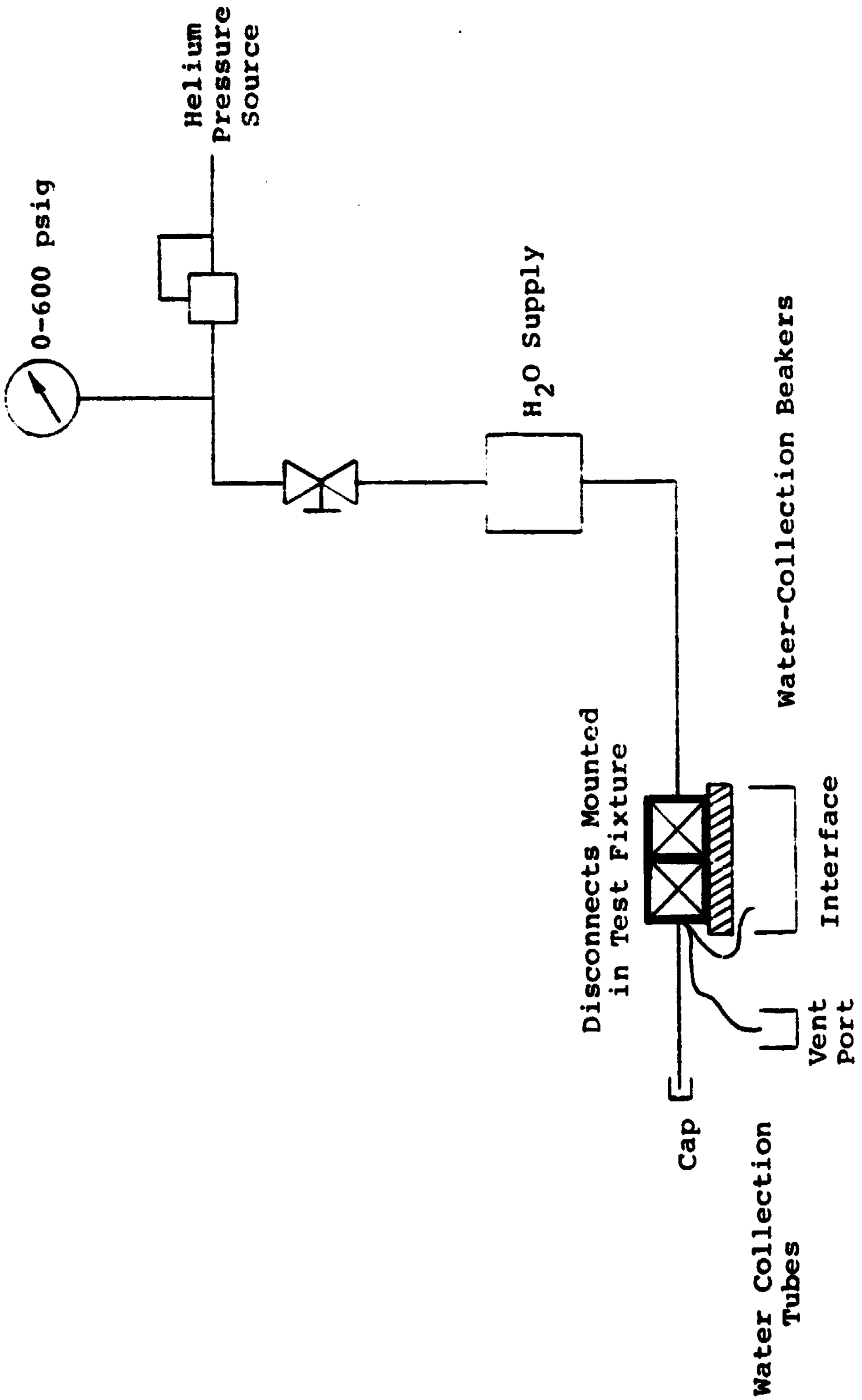


Figure 12. Interface Volume Test Setup Schematic

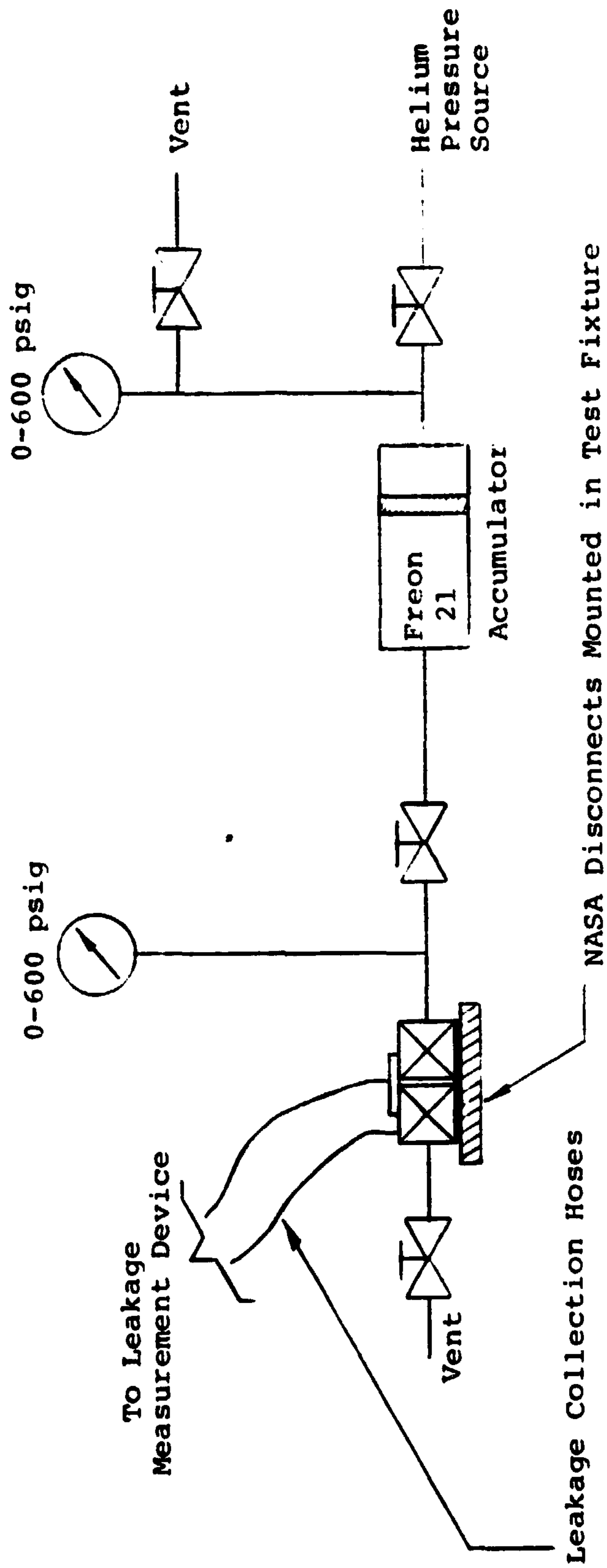


Figure 13. Freon 21 Leakage Test Setup Schematic

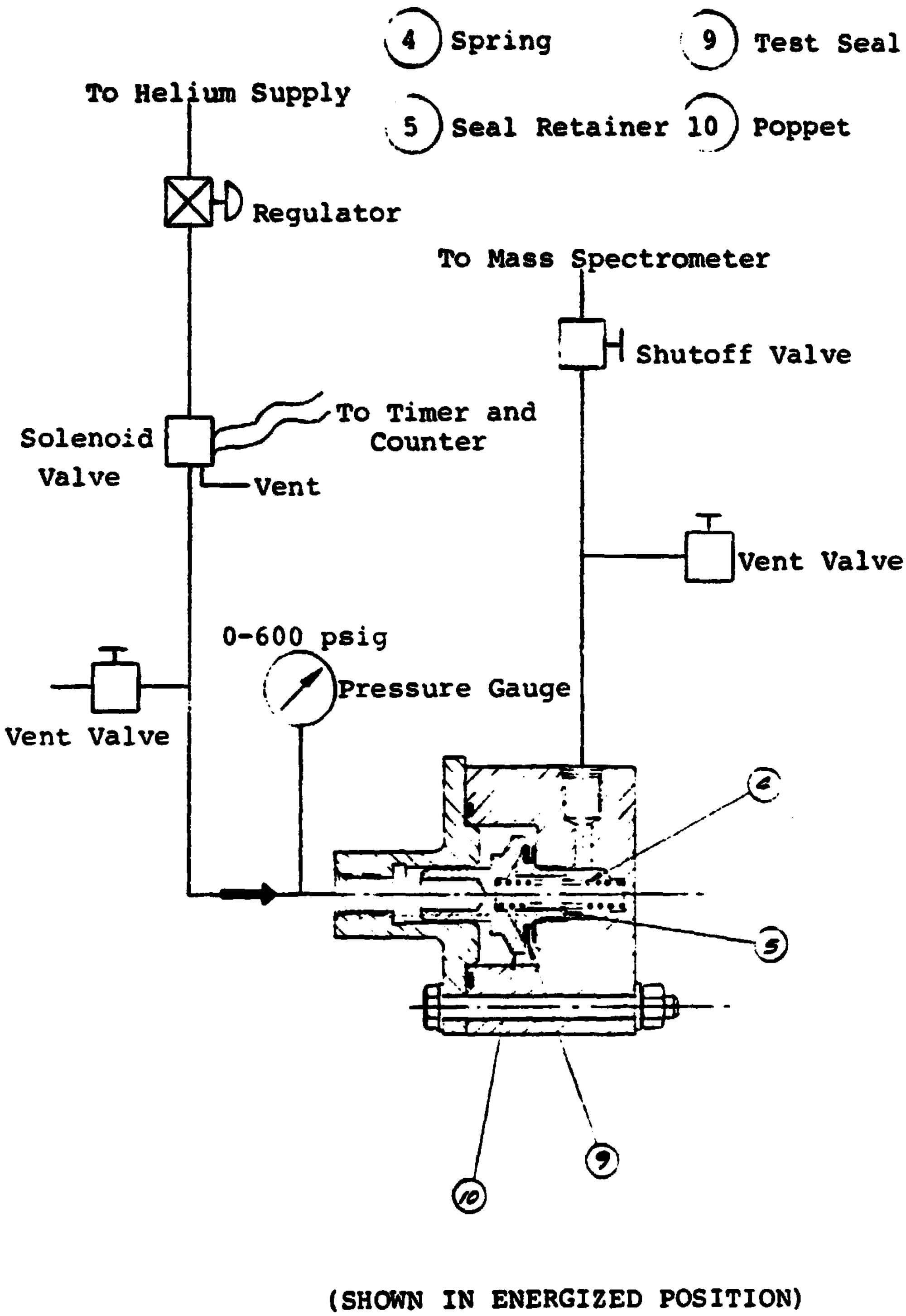


Figure 14. Special Seal Leakage Test Setup Schematic

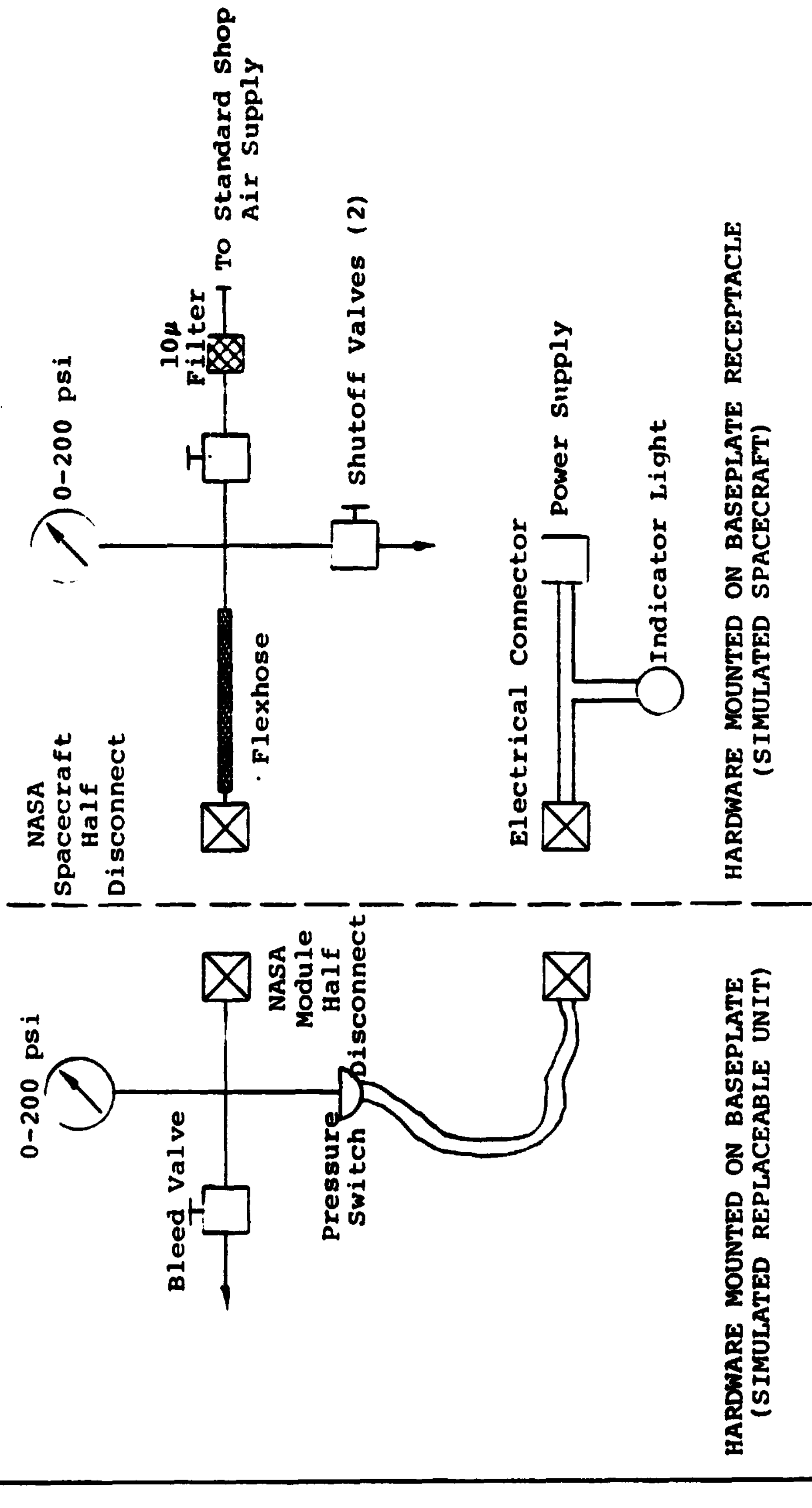
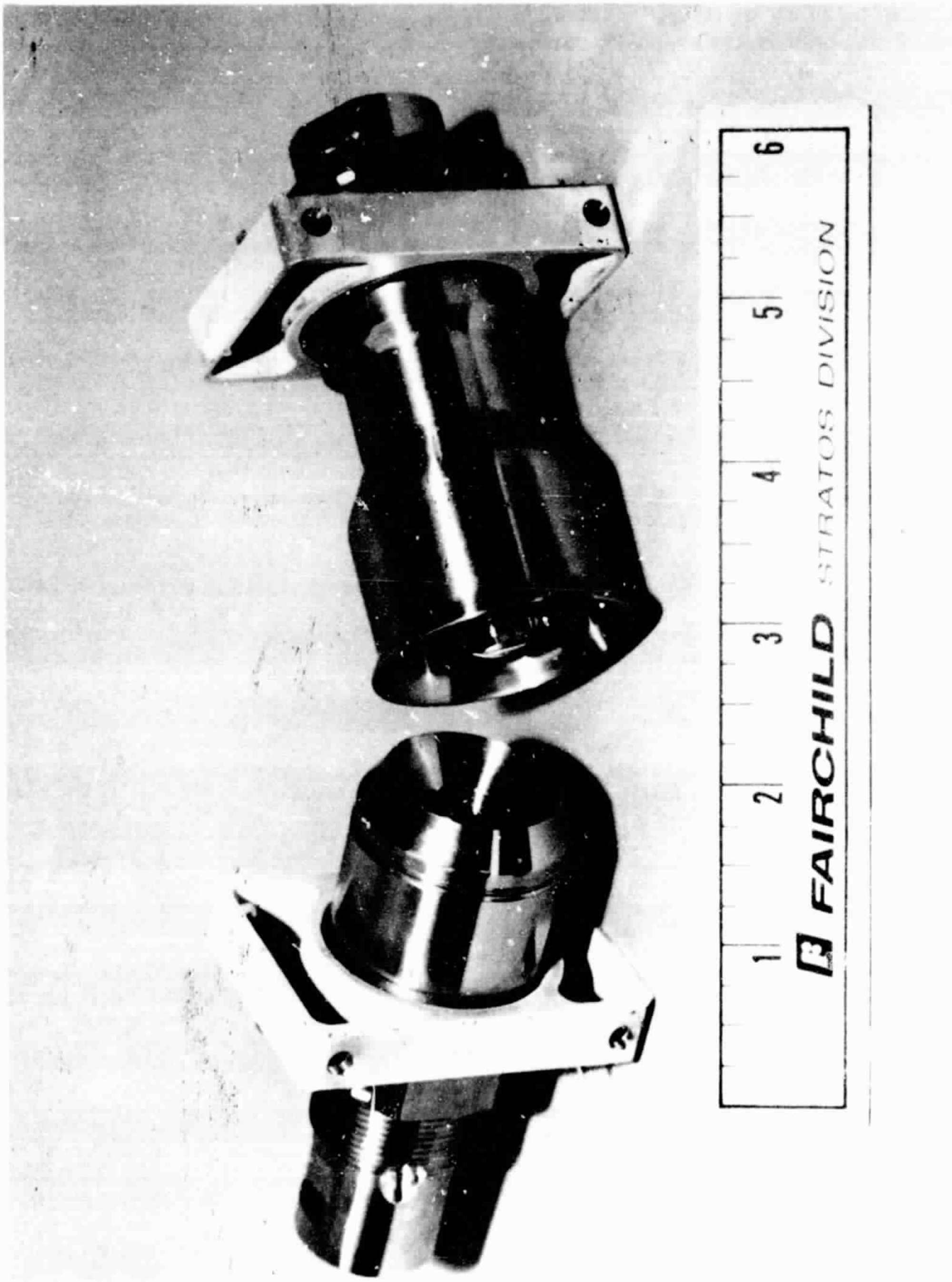
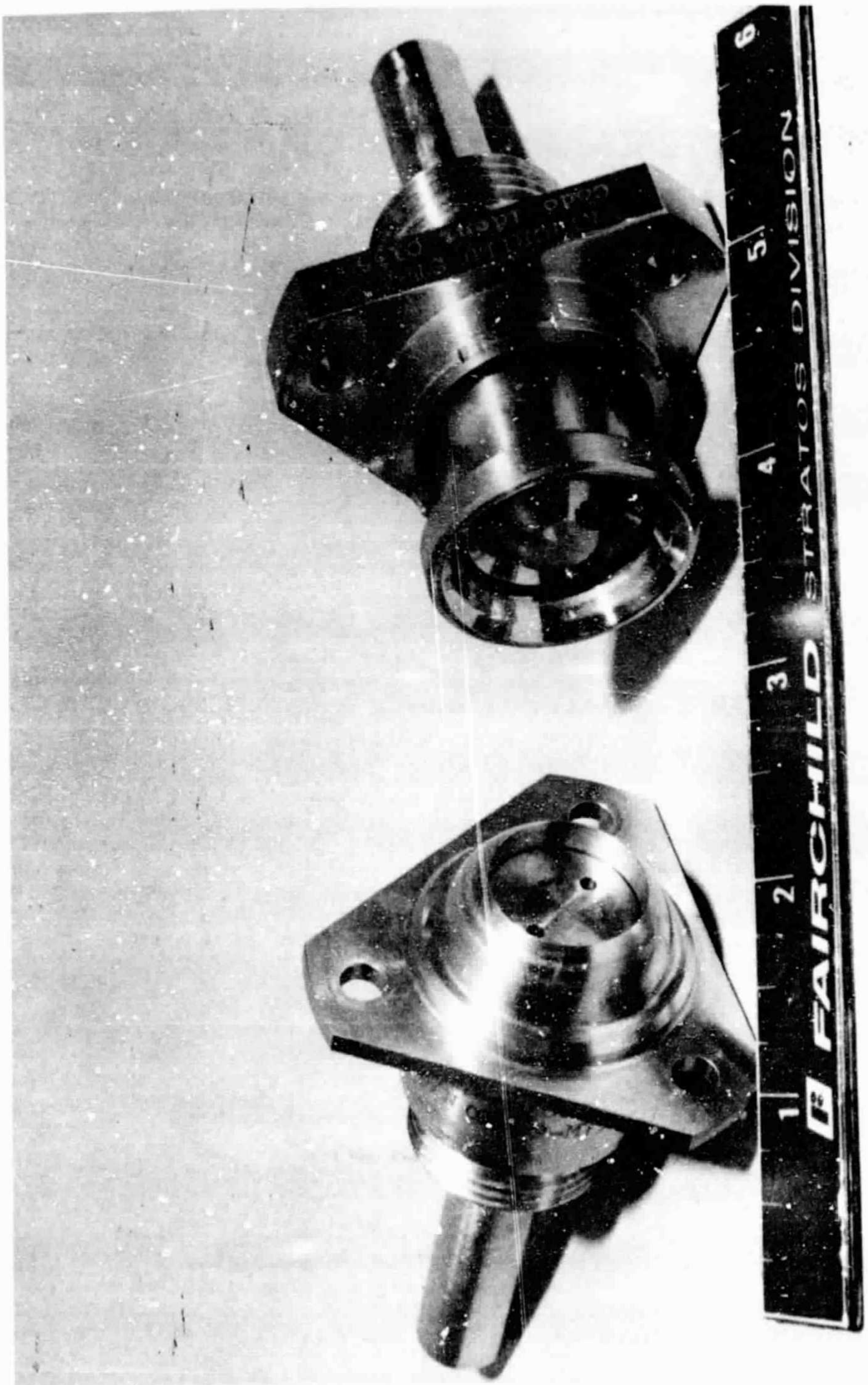


Figure 15. NASA Disconnect - Schematic for Martin Marietta MEM Demonstration



Photograph 1. NASA Prototype Disconnects



Photograph 2. JPL Disconnects

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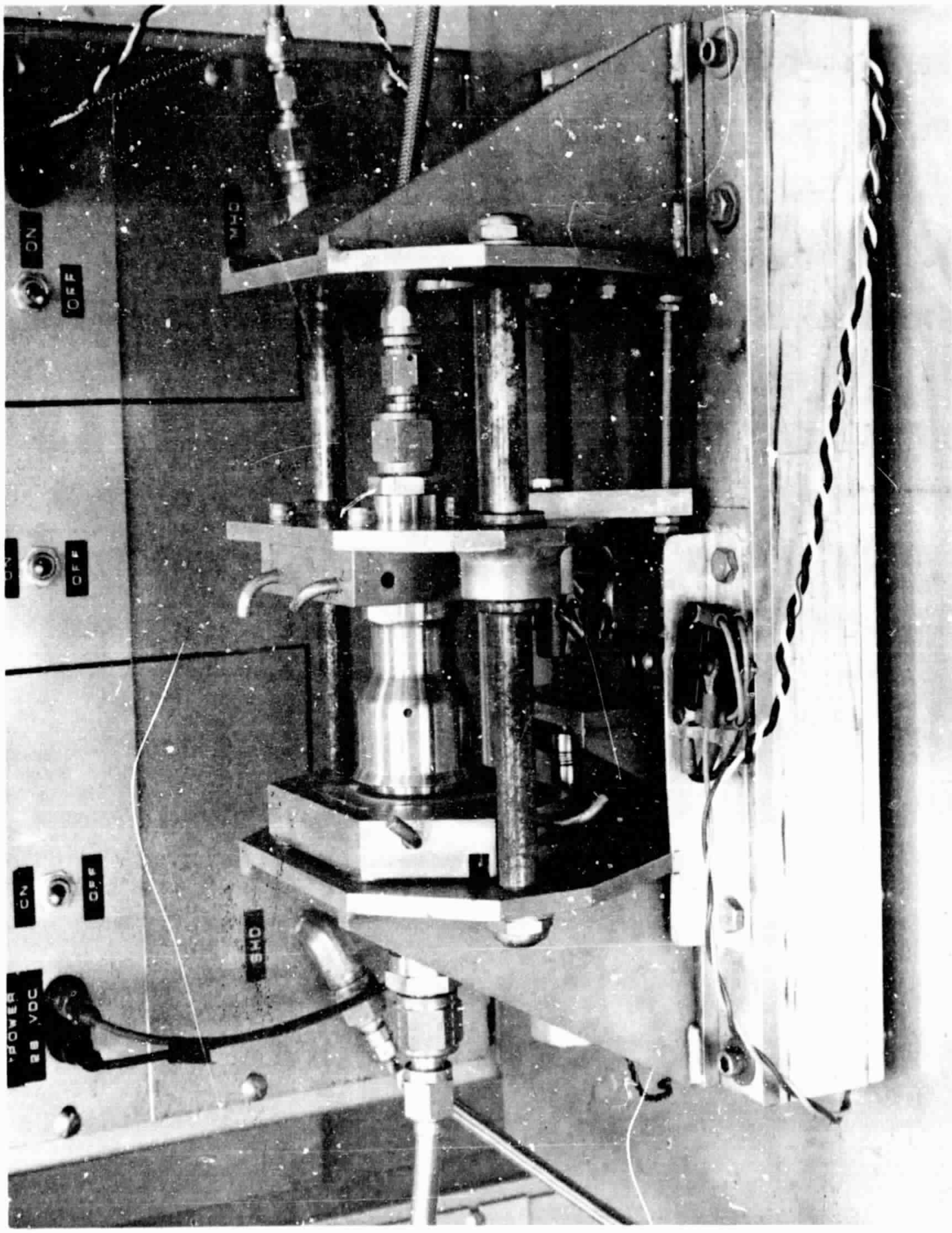

Photograph 3. Proof, Leakage, Functional & Cycling Test Fixture

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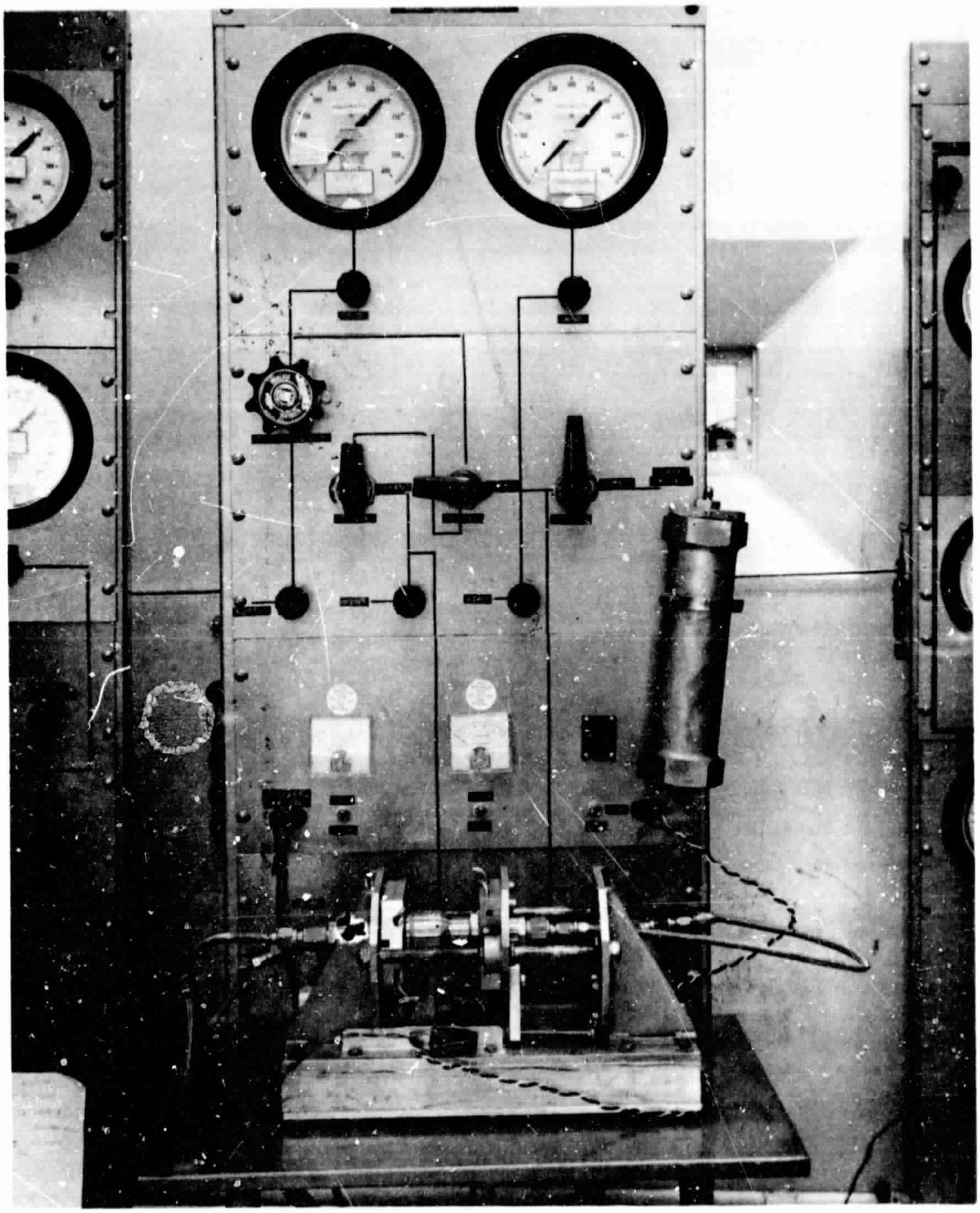
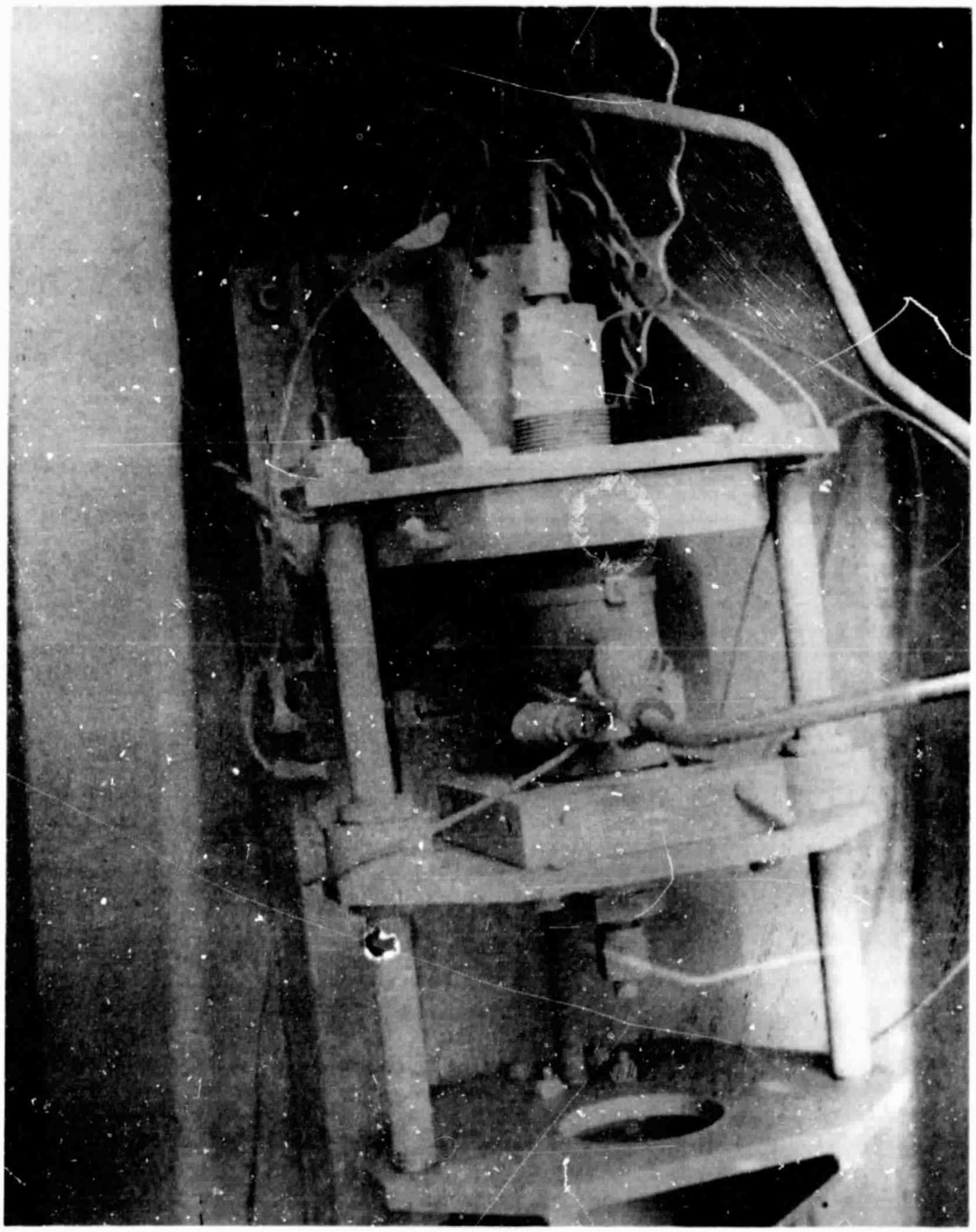
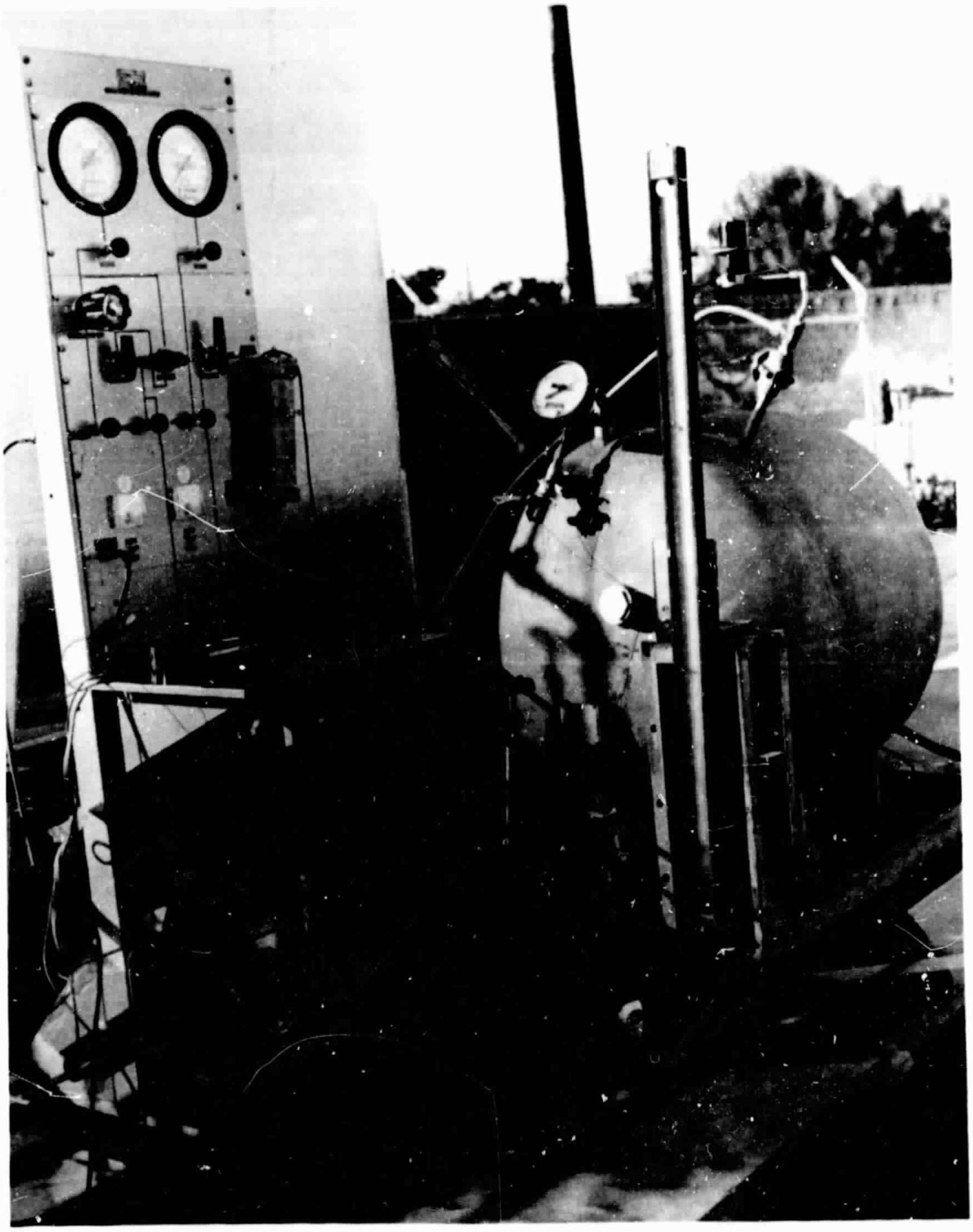


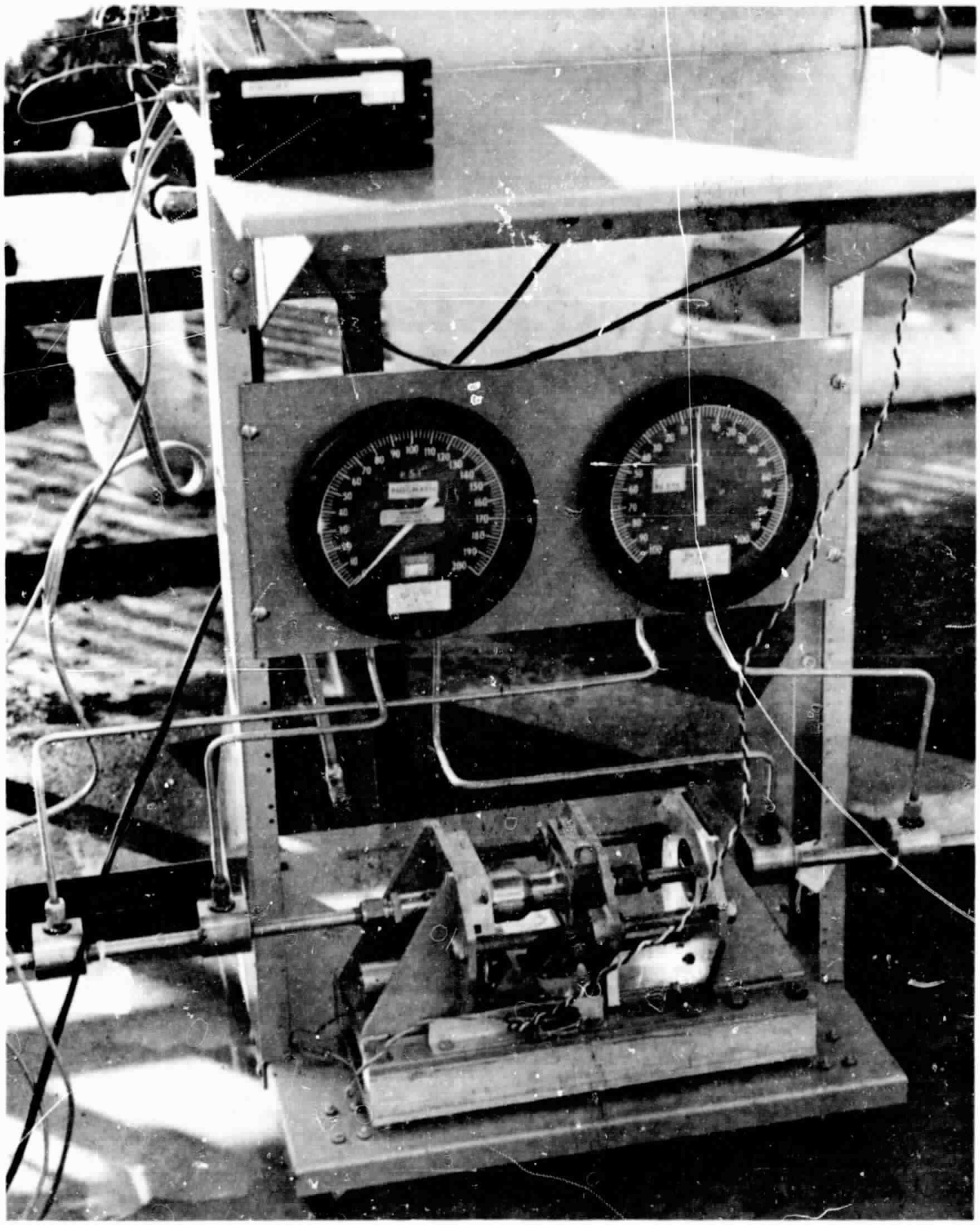
Photograph 4. NASA Disconnect Test Stand



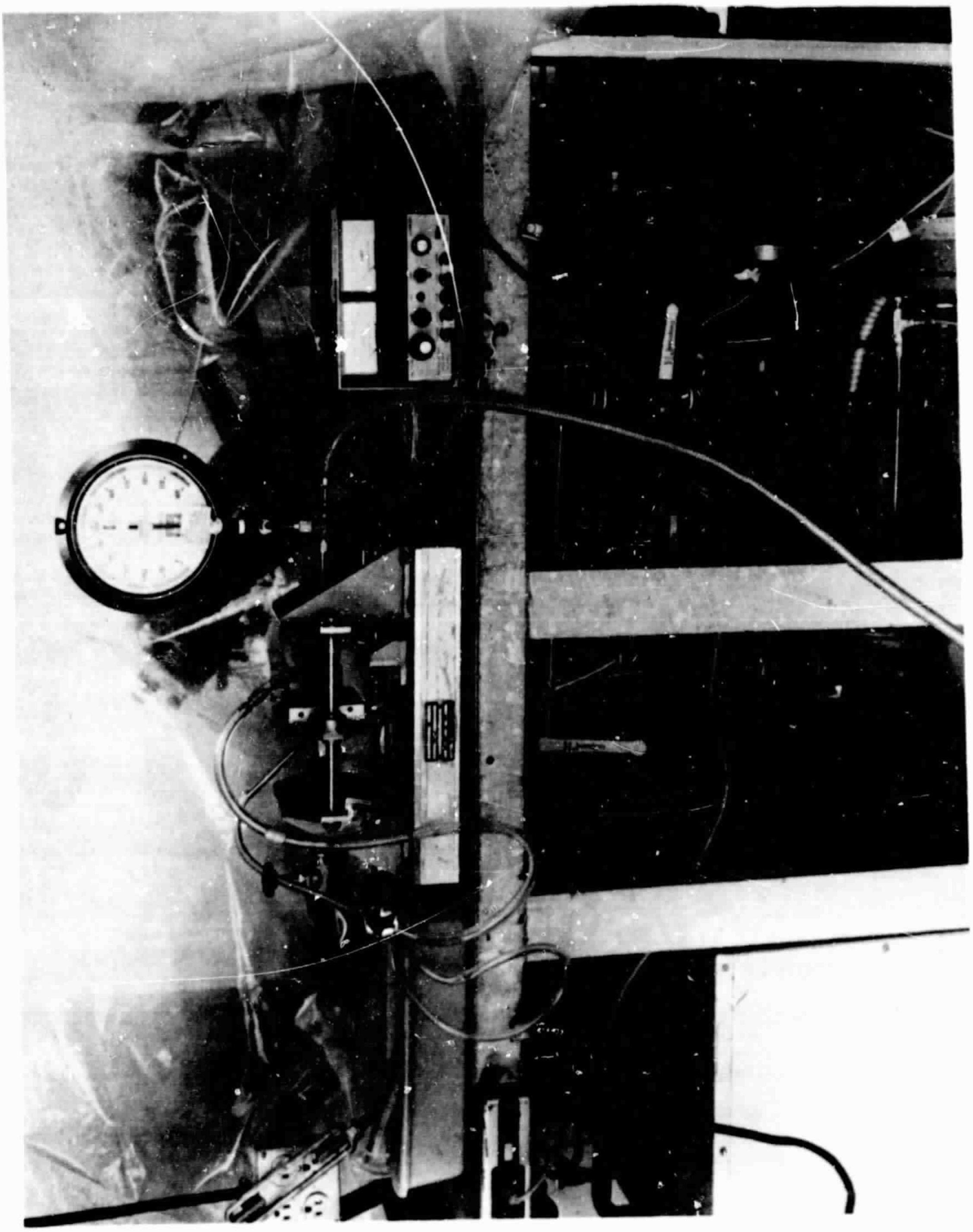
Photograph 5. Environmental Test Setup



Photograph 6. Flow/ΔP Test Setup

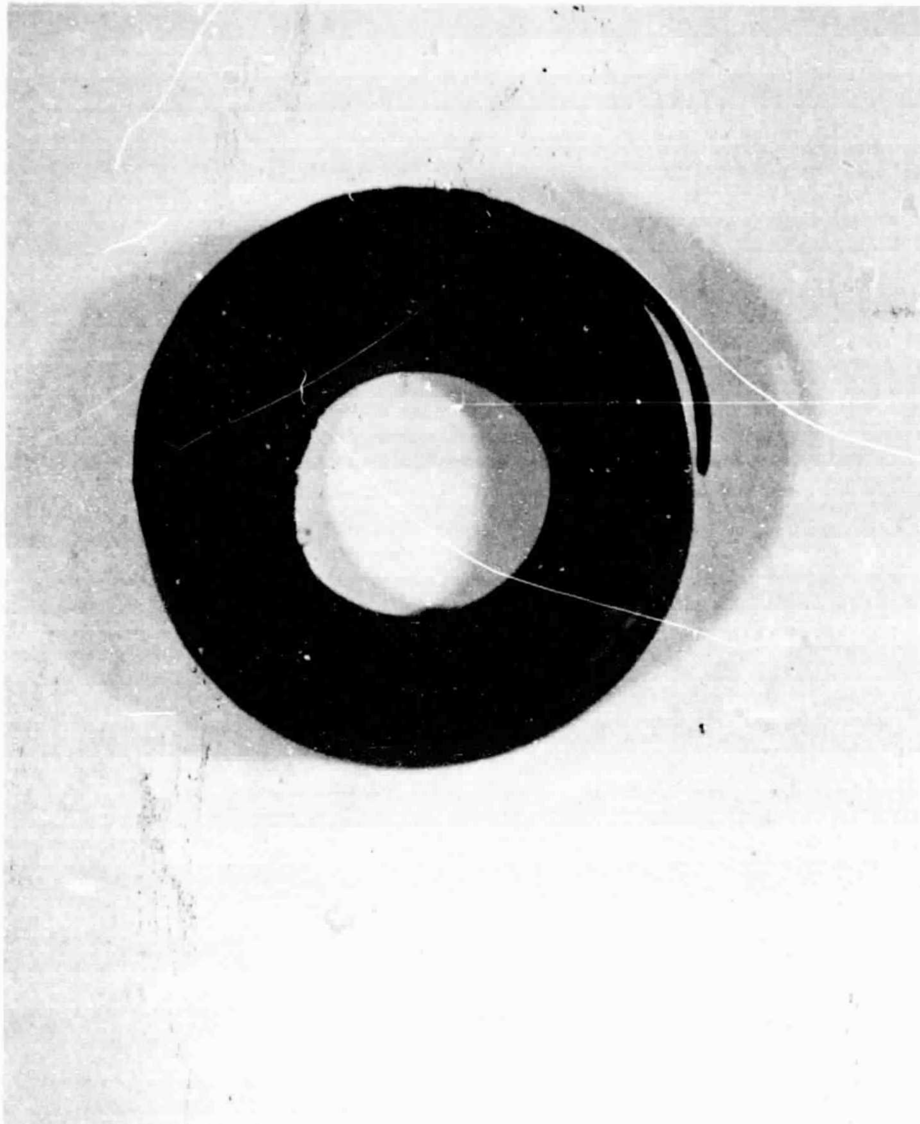


Photograph 7. Flow/ΔP Instrumentation

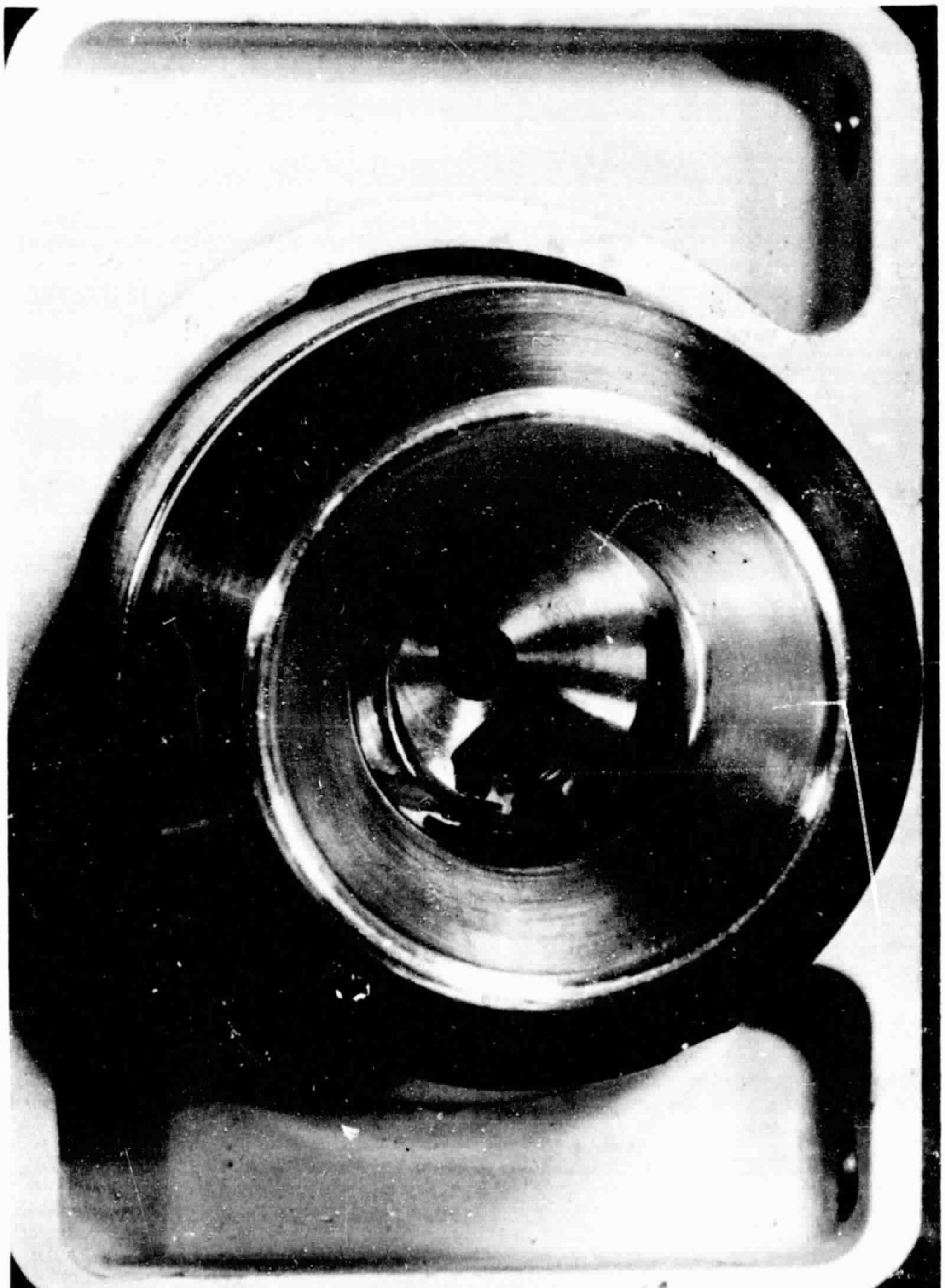


Photograph 8. Freon 21 Test Stand

Photograph 9. MHD Poppet Seal (Neoprene) After Freon 21 Test



Photograph 10. MHD Poppet Seal (Neoprene) After Freon 21 Test



Photograph 11. SHD Poppet Seal (Neoprene) After Freon 21 Test

Photograph 12. SHD Poppet Seal and Pieces of MHD Poppet Seal (Neoprene) After Freon 21 Test

Photograph 13. SHD Poppet Seal and MHD Poppet Seal (Neoprene) After Freon 21 Test

Photograph 14. MHD Poppet Seal (EPR) After Freon 21 Test

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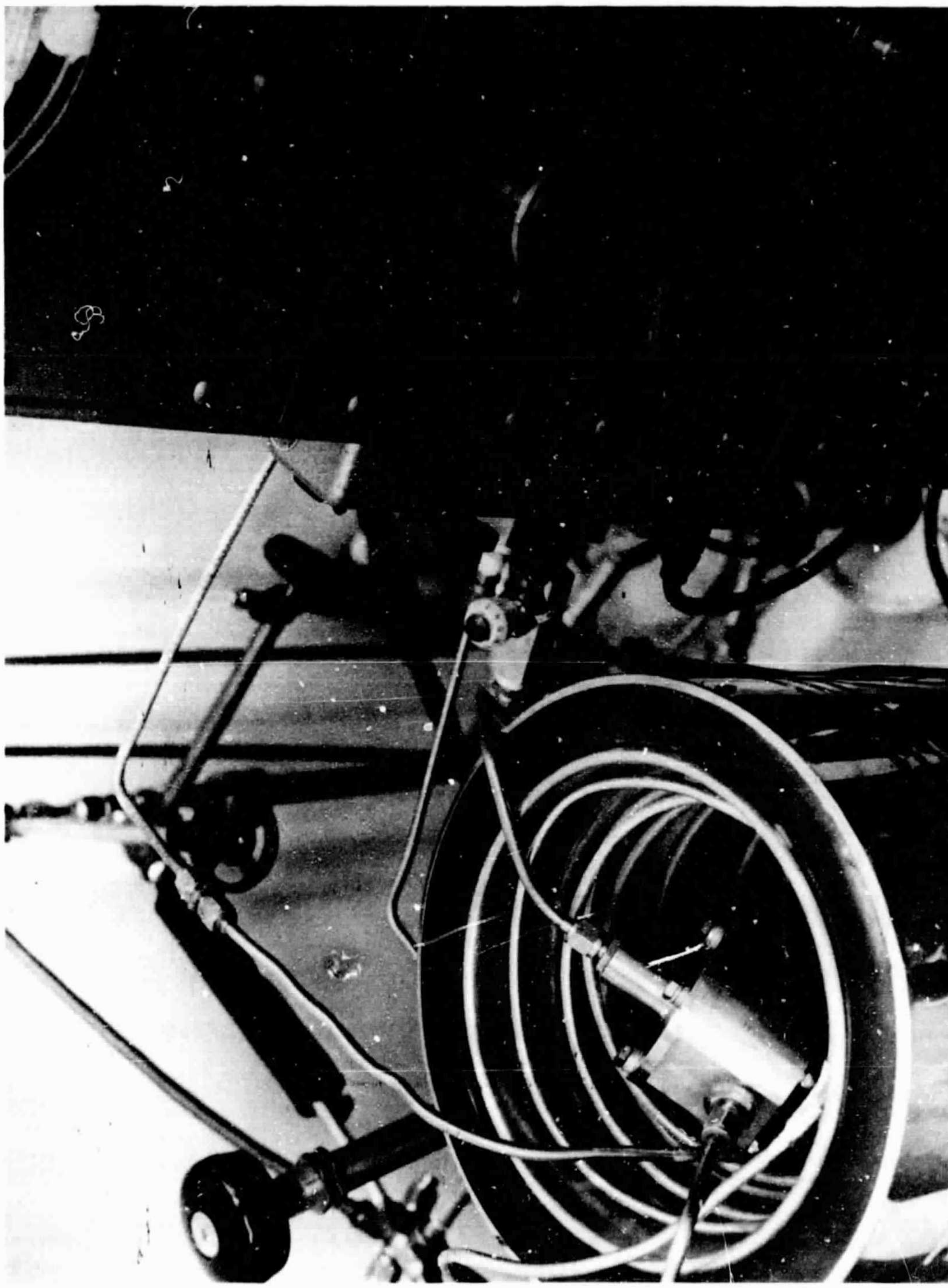

Photograph 15. Special Seal Leakage Test Setup

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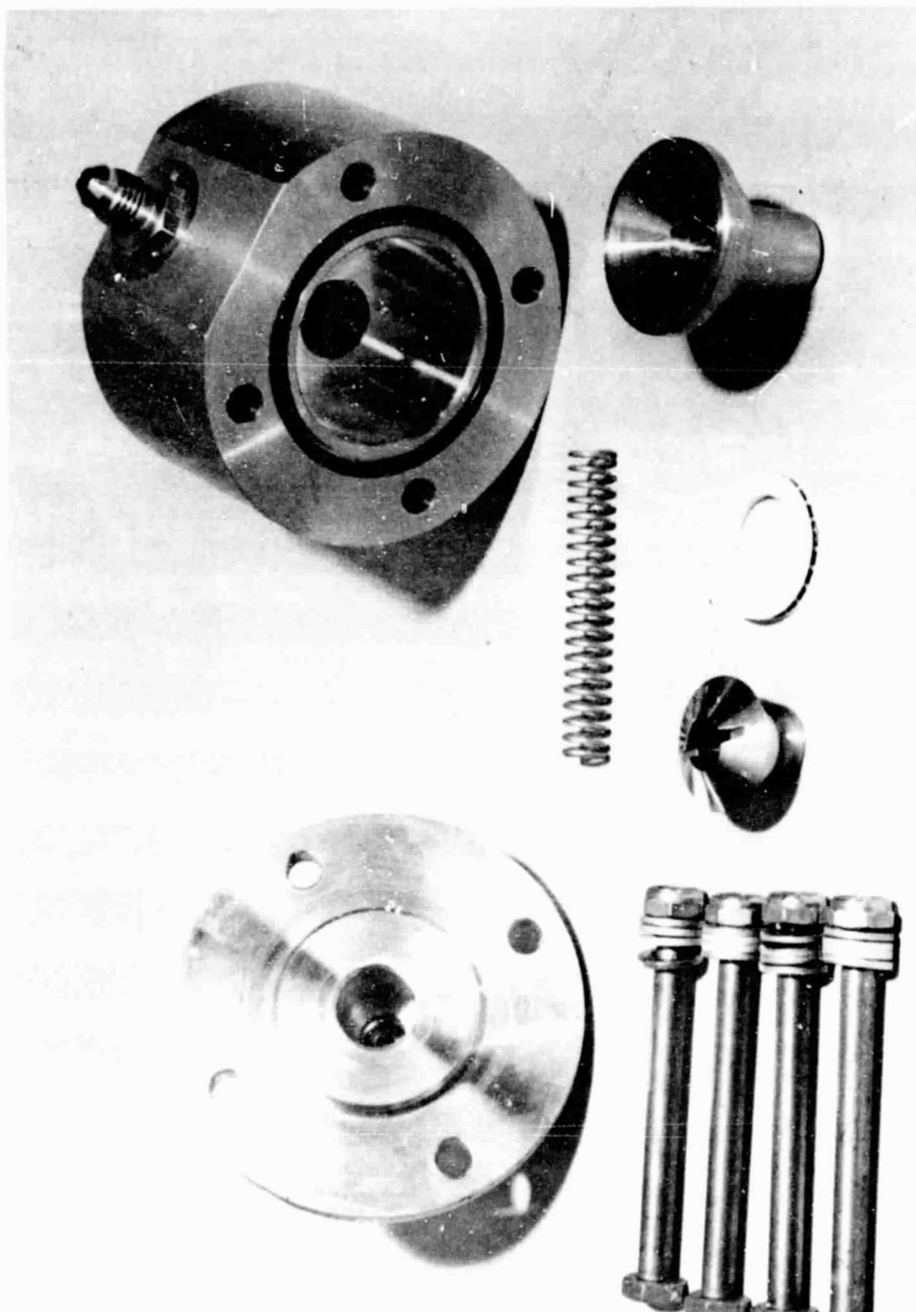

Photograph 16. Special Seal Leakage Test Fixture

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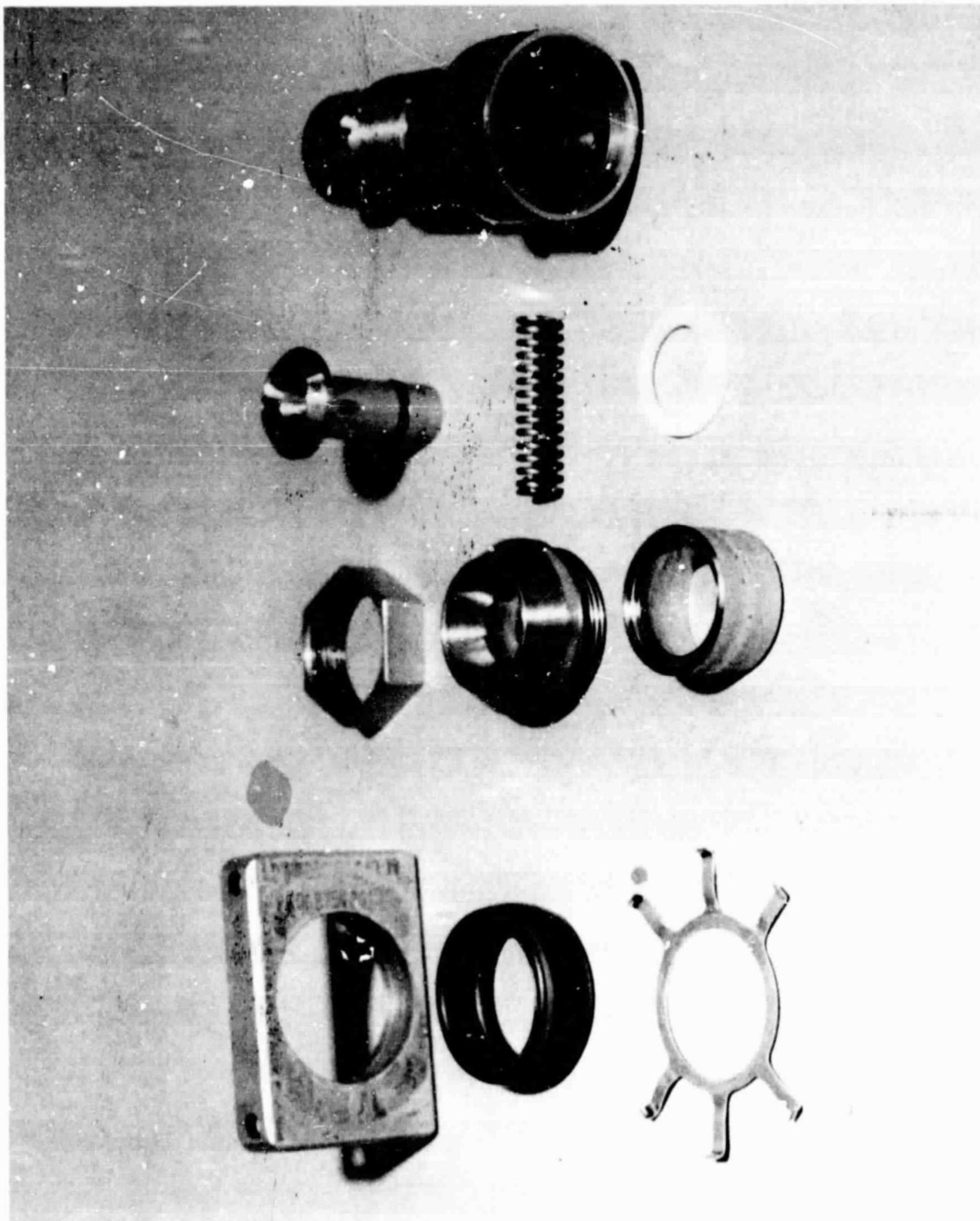
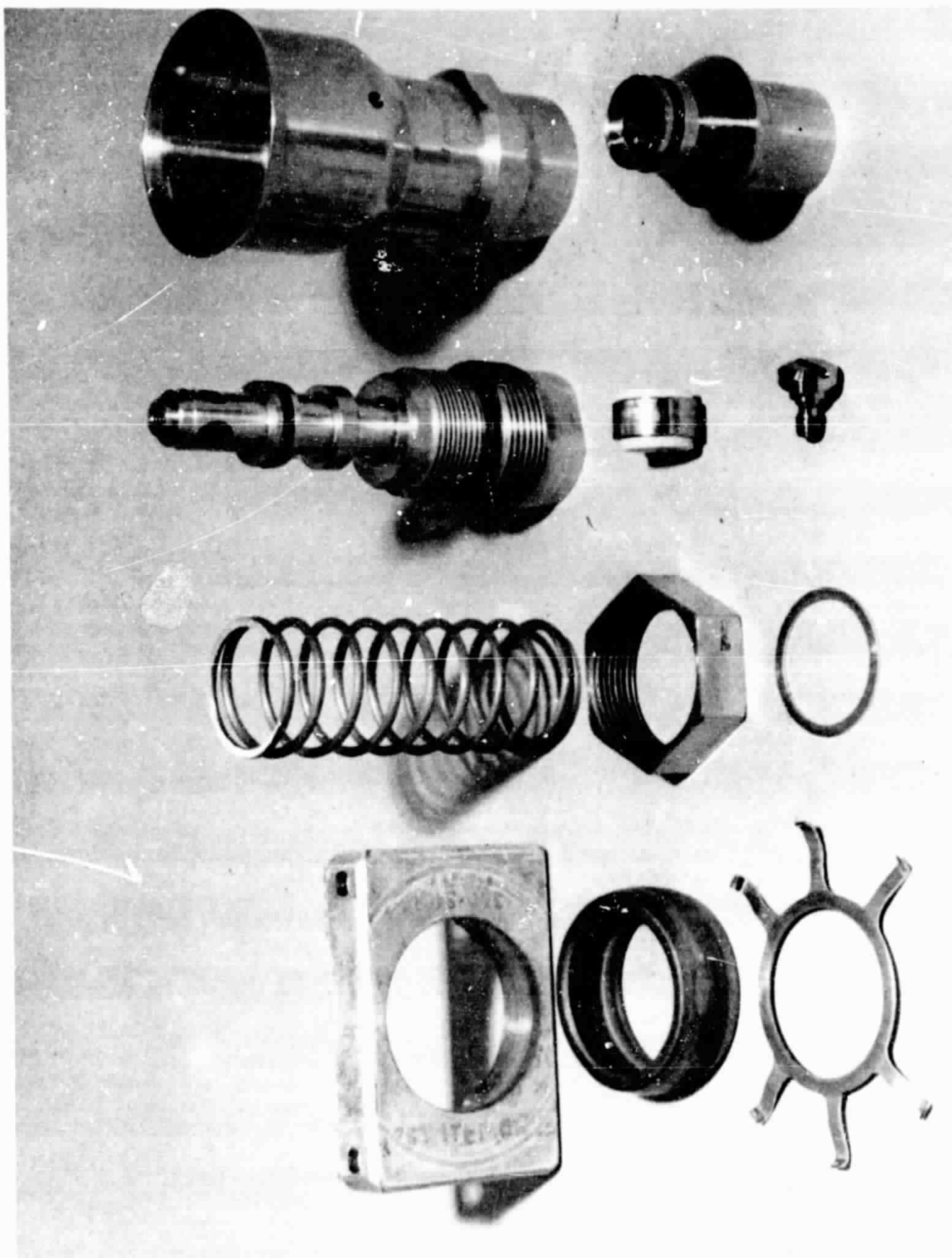
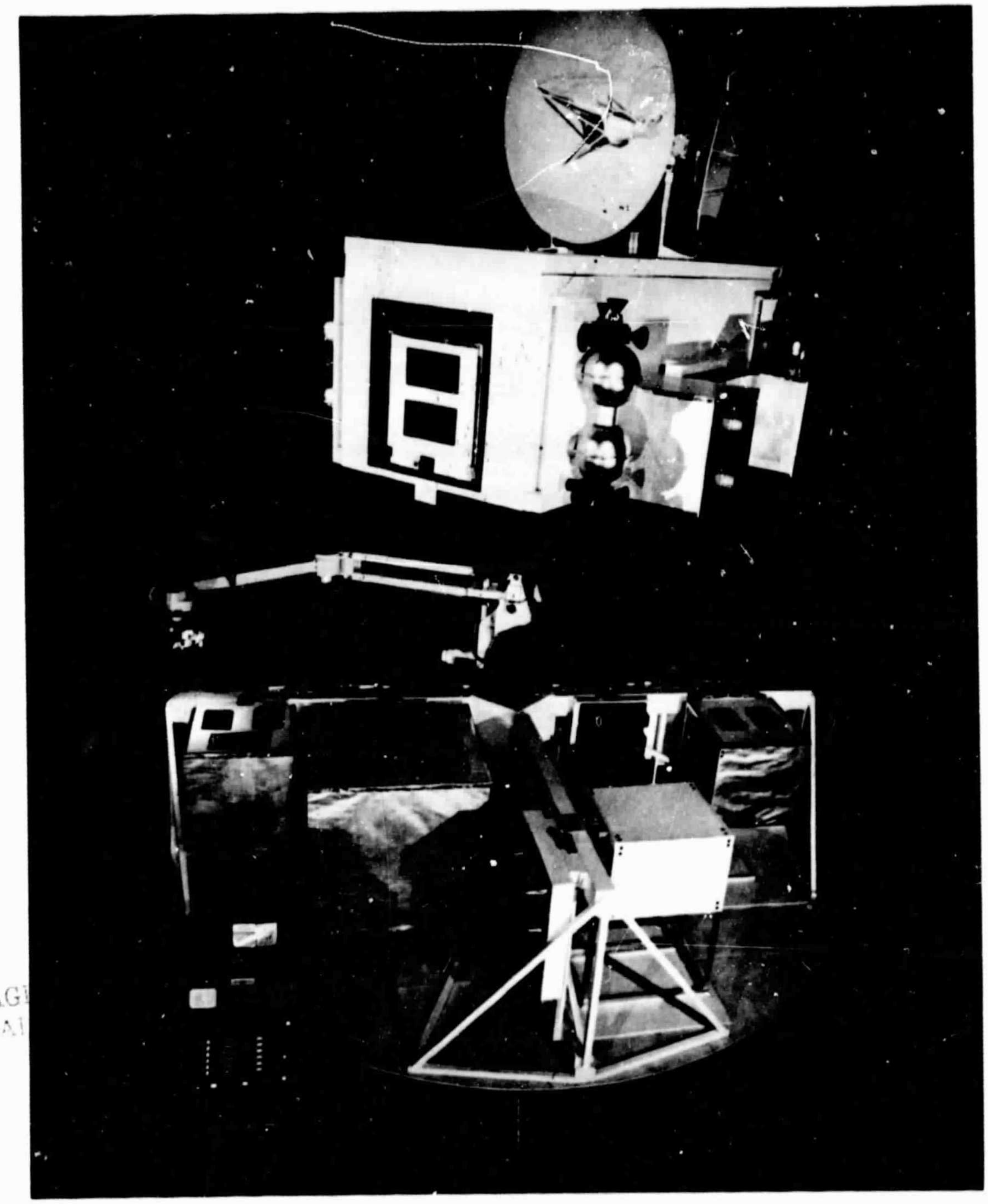


Photograph 17. Post Test Inspection - SHD



Photograph 18. Post Test Inspection - MHD



Photograph 19. Martin Marietta MEM

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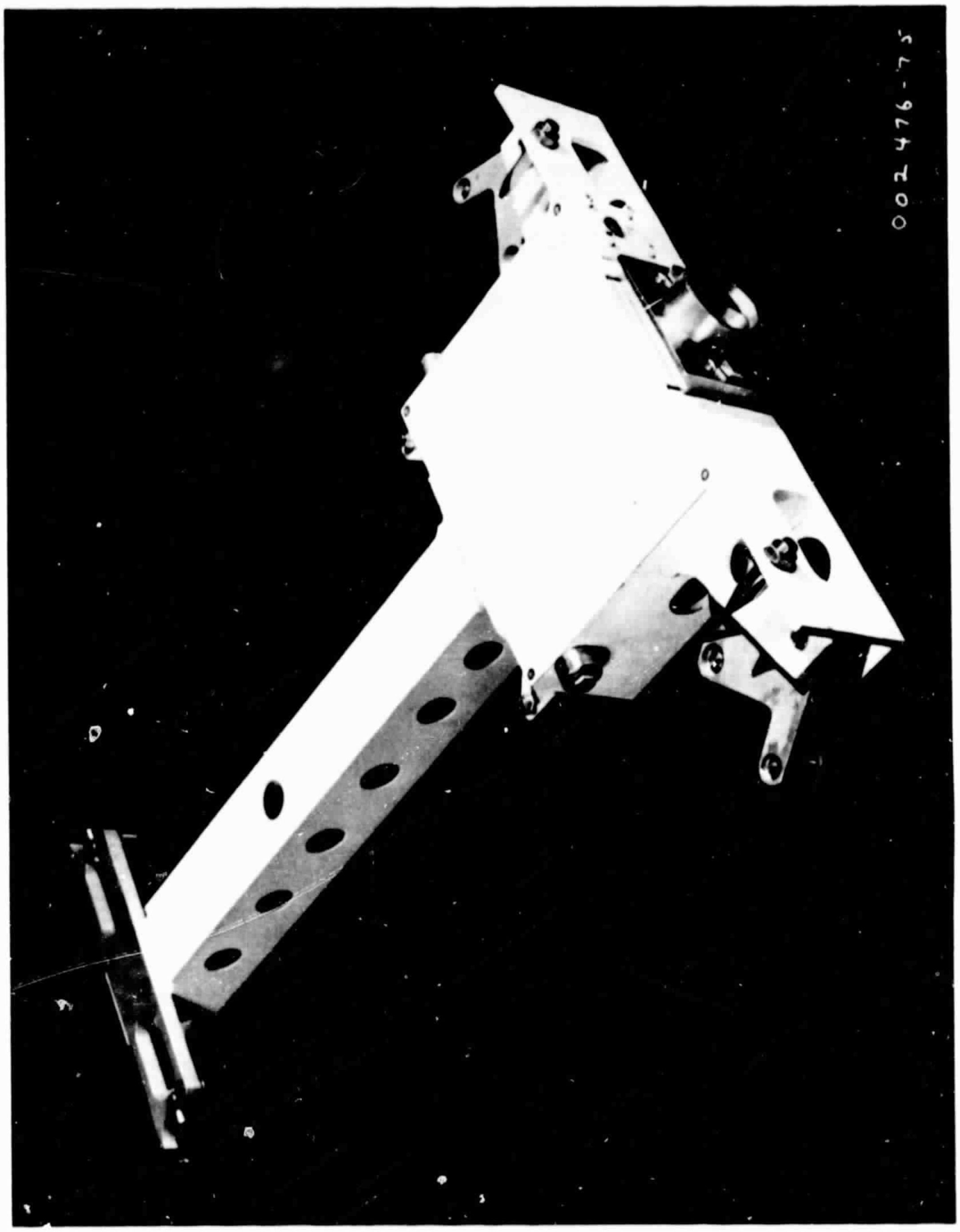

Photograph 20. MEM Baseplate

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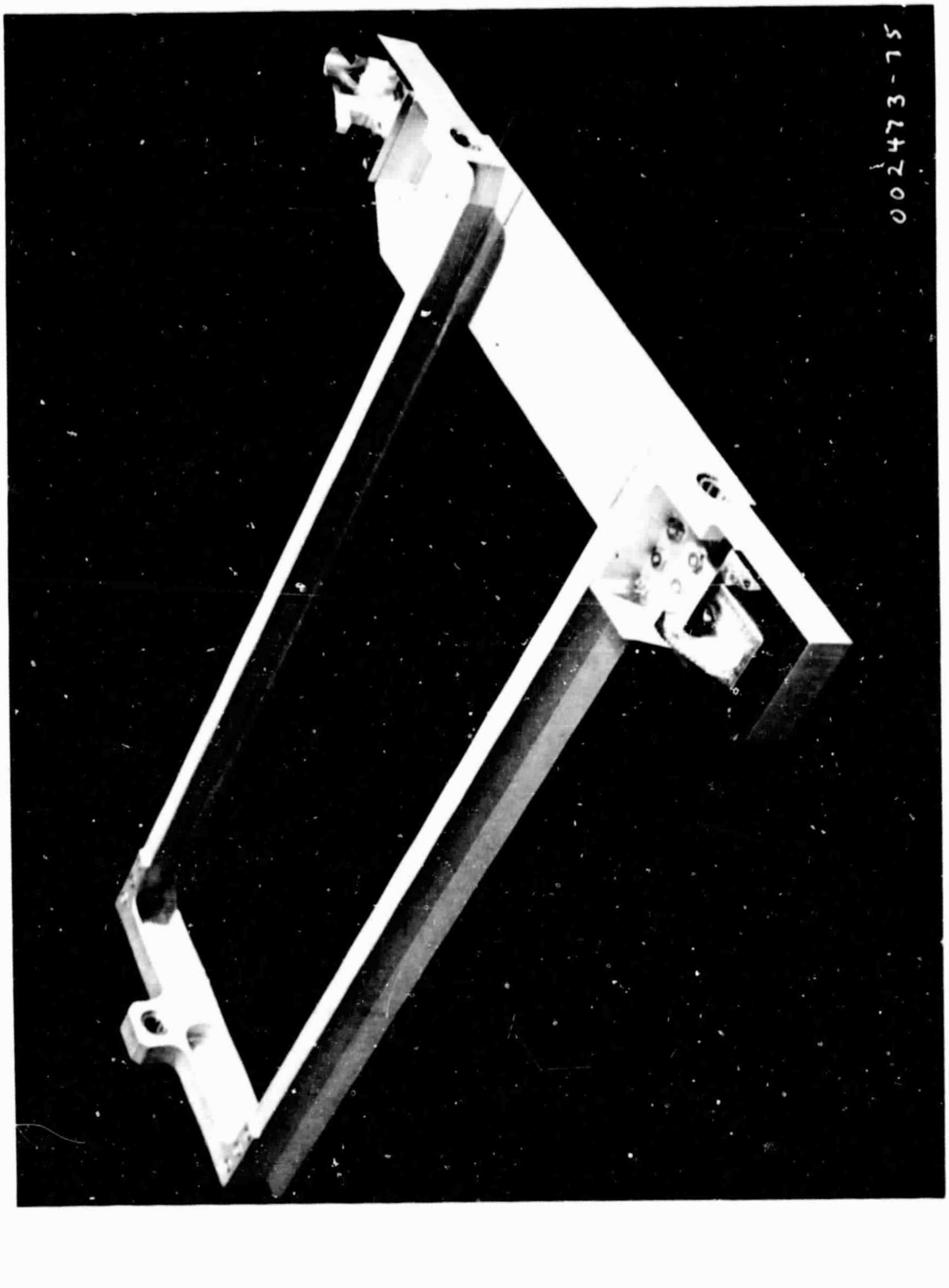
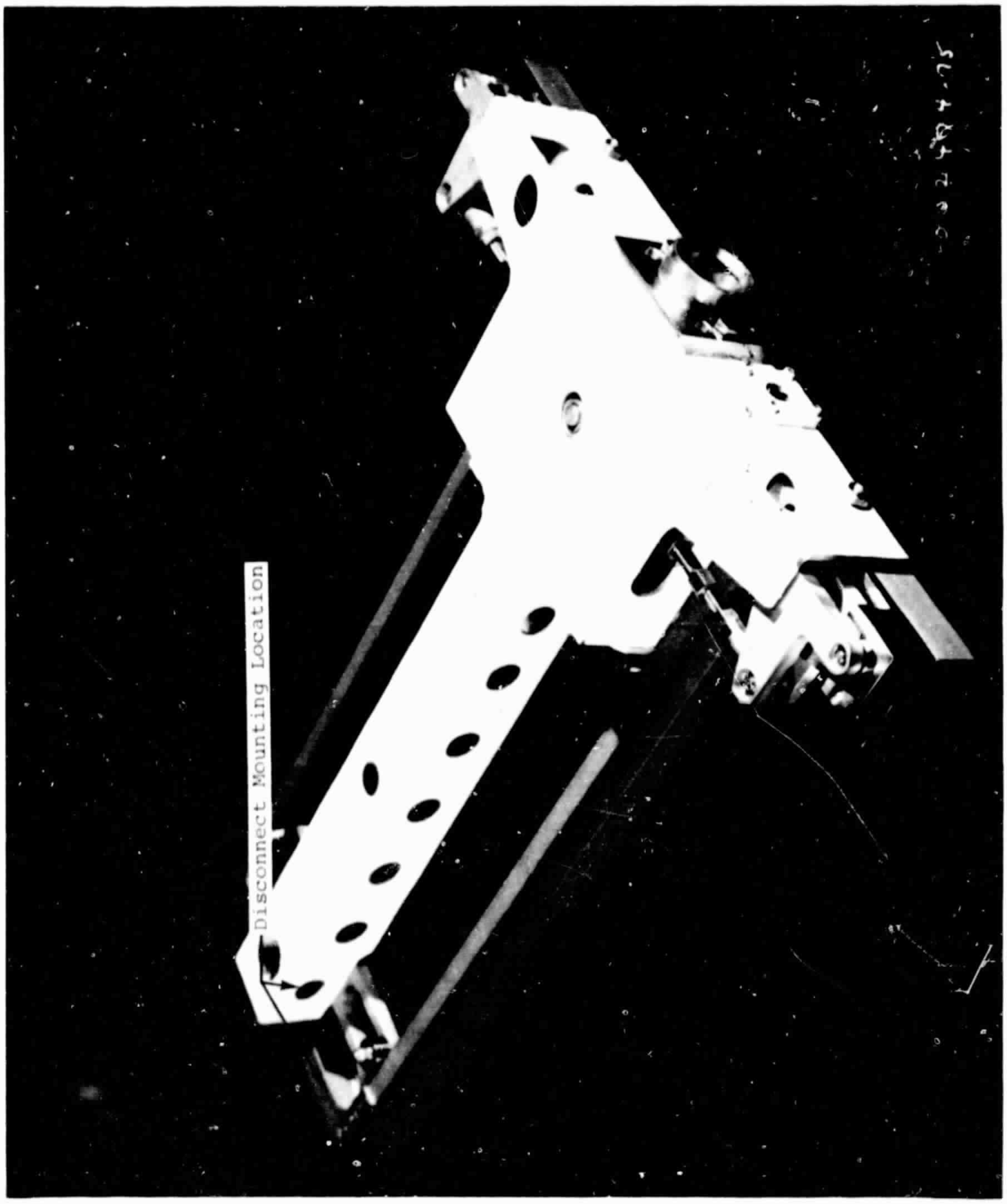


Photograph 21. MEM Baseplate Receptacle



Photograph 22. MEM Assembly

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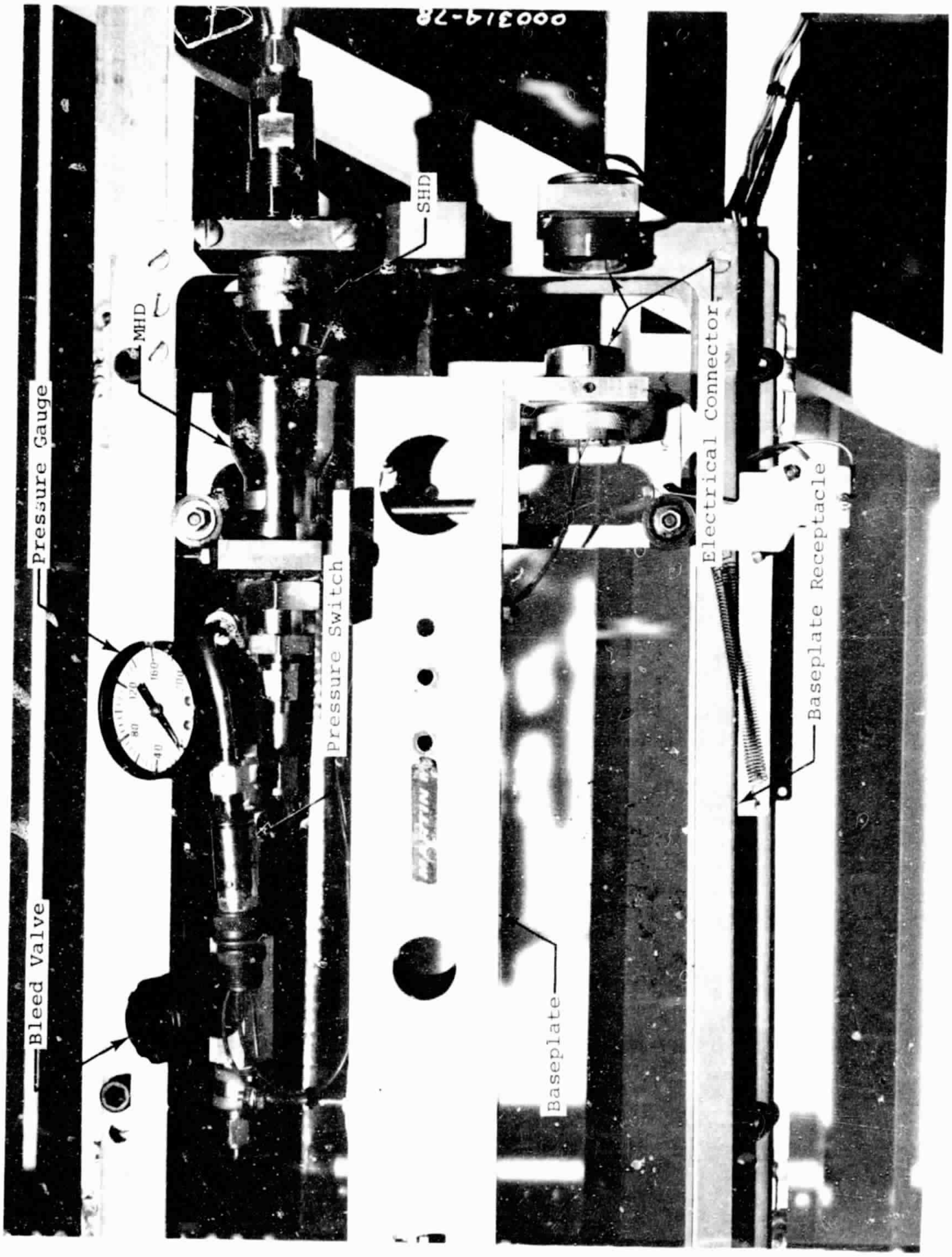

Photograph 23. NASA Disconnect Mounted on MEM Assembly

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APPENDIX I

WESRAC COMPUTER SEARCH SUMMARY

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MANHATTAN BEACH CALIF 90266

WESRAC COMPUTER SEARCH

I. KEY WORDS (SINGULAR AND PLURAL FORMS USED)

Disconnect(s)
Quick Disconnect(s)
Coupling(s)
Fluid Coupling(s)
Fluid Hardware
Fluid Connector(s)
Mechanical Coupling(s)
Liquid Coupling(s)
Gaseous Coupling(s)
Coupling Devices

II. MODIFIERS

High Pressure
Moderate Pressure
Low Pressure
High Temperature
Low Temperature
Cryogenic
Hypergolic
Hazardous Fluid(s)
Liquid Hydrogen
3000 psi, psia, psig
100 psi, psia, psig
1/4 Inch
1/2 Inch
1 Inch
2 Inches

III EXCLUSIONS

Electrical

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WESRAC COMPUTER SEARCH

INDEX/DATA BASE	KEY WORD HITS	CROSS COUPLING (INTERSECT HITS)
ISMEC (Mechanical Engineering)	120	3
CLAIMS/GEM (patents since 1975)	8	0
NTIS (U.S. Technical Information Service)	96 (83 w/exclusion)	3
NASA (Aerospace since 1963)	497	10

ABSTRACTS ORDERED

1.	All key word hits from ISMEC	120
2.	None from CLAIMS/GEM	0
3.	Key word hits with exclusion from NTIS	83
4.	All intersect hits from NASA	10
		213

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NASA DISCONNECT PROGRAM
RECAP OF HARDWARE SURVEY
COMPUTER SEARCH DOCUMENT REVIEW SUMMARY

1. Proceedings of the Conference on the Design of Leak-Tight Fluid Connectors

   The proceedings deal primarily with mechanically connected fluid joints, such as flanged, bolted, and B-nut types. There was one true disconnect described conceptually, a hermaphroditic type of self-latching unit. This design possesses some interesting features, but is not designed for connection while pressurized. Very high forces would be required to accomplish pressurized connection.

2. USAAVLABS Technical Report 68-37, "Development and Test of an Automatic Shutoff Closed Circuit Refueling System"

   The fluid coupling discussed in this report is basically a closed circuit ground refueling system for helicopters. While both halves of this coupling incorporate the required self-sealing feature, they are designed strictly for manual operation, atmospheric receiver tank pressure, and low ($<$50 psi) fill pressures.

3. AFAPL Technical Report 68-19, "Variable Flexibility Tether System"

   This system was investigated to determine what advantage might be taken of the innovative latching and interlock devices designed for use with the tether. These devices were basically unproven and relatively complex in our application where very high reliability is desired.

4. NASA Technical Memorandum X-64849, "An Assessment of Separable Fluid Connector System Parameters"

   This report of an optimization study deals exclusively with flanged and bolted fluid connections of various configurations utilizing a variety of static sealing techniques.

5. NASA Case No. MFS 20395, "Duct Coupling for Single-Handed Operation"

   As the title indicates, this patented design provides a simplified connection method for the manual coupling of duct sections. It is intended to be suitable for use by a suited astronaut during EVA (Extra Vehicular Activity).

6. Woods Hold Oceanographic Institution Report AD 697-294, "Hand Tools and Mechanical Accessories for a Deep Submersible"

Over 400 pages long, with more than 250 illustrations, this report discusses and depicts a variety of mechanical coupling devices used for remote and semi-remote retention and release of equipment. While very few, if any, of the devices illustrated have direct application to our specific case, some of the concepts may be useful further along.

7. NASA Technical Brief 67-10256 (Moderate Side Loading Quick Disconnect)

The brief describes a ball lock and spring steel tongue arrangement which disconnects with the application of a 15 lb_f side load when line pressure is 100 psig. This concept is not applicable to our case.

8. General Dynamics/Convair Final Report GD/C-BHV65-004, "Preliminary Design of a Flox Disconnect for a Flox-Atlas Vehicle"

This double butterfly design includes large unbalanced bellows pressure areas. The separation loads associated with the low pressure, high flow rate disconnect must be carried by the attach structures. This design is thus not appropriate for our applications.

ID NO.- EI760851442 651442
WORKING FLUID OF HIGH FLASH-POINT IN FLUID COUPLINGS.
Sebestyen, Gyula; Vargha, Laszlo; Stvrteczky, Ferenc; Katona, Lajos
Tech Univ Budapest, Hung
DESCRIPTORS- (*COUPLINGS, *Hydraulic), HYDRAULIC FLUIDS,
CARD ALERT- 602, 632
SOURCE- Conf on Fluid Mach, 5th, Proc, Budapest, Hung, 1975 v 2 p 979-986. Publ by Akad Kiado, Budapest, Hung, 1975
Authors publish the results of comparing tests of torque transmission of fluid couplings filled with hydrocarbon-base and with high flash-point silicon oils. Conclusions regarding the influence of viscosity on the torque transmission are also presented. 7 refs.

ID NO.- EI760851441 651441
MODEL INVESTIGATIONS OF HIGH POWER FLUID COUPLINGS WITH REGULATED AMOUNT OF FILLING.
Dabrowski, Stanislaw
Inst of Fluid-Flow Mach, Gdansk, Pol
DESCRIPTORS- (*COUPLINGS, *Hydraulic), (FLOW OF FLUIDS, Mathematical Models),
CARD ALERT- 631, 632
SOURCE- Conf on Fluid Mach, 5th, Proc, Budapest, Hung, 1975 v 1 p 197-209. Publ by Akad Kiado, Budapest, Hung, 1975
The impossibility of preserving all conditions of hydrodynamic flow similarity in model investigations of high power fluid couplings with regulated amount of filling has been proved in the report. The model investigations carried out showed that equality of Reynolds numbers and determination of quantities Q//z, which express the feeding fluid flow rate, according to the formula Q//z $similar$ n//1d**3, where n//1 is the rotational speed of the coupling impeller and d is the impeller diameter, are the essential requirements to be met in order to achieve an approximate hydromechanical flow similarity in two geometrically similar couplings. The parameter Q//z, neglected until now in investigations, has the essential influence on the shapes of axial thrust curves of a coupling. 4 refs.

ID NO.- EI760850484 650484
FOURIER TRANSFORM APPLIED TO VEHICLE EXTERIOR NOISE SOURCE IDENTIFICATION.
Daniels, V. A.; Veres, R. E.
Ford Mot Co
DESCRIPTORS- (*AUTOMOBILES, *Noise), NOISE ABATEMENT, (MATHEMATICAL TRANSFORMATIONS, Fourier Transforms),
CARD ALERT- 662, 751, 921
CODEN- SEPPAB SOURCE- SAE Prepr n 760151 for Meet Feb 22-27 1976, 8 p
This paper discusses a motor vehicle noise source identification technique designed for use during the SAE J986a or similar drive-by test procedure. It provides, by application of the Fourier Transform, the capability to obtain a narrowband (9. 8 Hz) frequency resolution over an extended frequency range (0-10,000 Hz) at the peak vehicle noise level, a particular RPM, or a particular vehicle location in the test zone. Other features include corrections for the Doppler shift, averaging of noise tests, and subtraction of spectra of two separate noise tests from a component disconnect/reconnect procedure. The above analysis, in conjunction with the noise source isolation resulting directly from the disconnect procedure, identifies the major vehicle noise contributors in terms of their respective amplitudes and frequencies. Application of this technique to several vehicles has demonstrated its ability to accurately identify the dB(A) levels and problem frequencies of the major vehicle noise contributors in the vehicle environment.

ID NO.- EI760850321 650321
MECHANICAL RESPONSE AND THERMAL COUPLING OF METALLIC TARGETS TO HIGH-INTENSITY 1. 06- mu LASER RADIATION.
Hettche, L. R.; Tucker, T. R.; Schriempf, J. T.; Stegman, R. L.; Metz, S. A.
NRL, Washington, DC
DESCRIPTORS- (*ALUMINUM AND ALLOYS, *Irradiation), (LASER BEAMS, Effects), TITANIUM AND ALLOYS,
CARD ALERT- 541, 542, 744
CODEN- JAPIAU SOURCE- J Appl Phys v 47 n 4 Apr 1976 p 1415-1421
Mechanical response and thermal coupling measurements are reported for aluminum and titanium targets exposed to high-intensity 1. 06- mu laser radiation. Measurements are made in air and vacuum for pulse lengths from 1 to 100 mu sec, providing incident fluences of between 10**6 and 10**8 W/cm**2. The observed behavior is consistent with the presence of an optically absorbing plasma at the target surface. The decrease in the thermal coupling coefficient is attributed to an increase in the plasma propagation velocity with intensity. 29 refs.

ISMEC

ABSTRACTS

ID NO.- EI760749654 649654
TUBE VIBRATION IN BOILER AND OTHER HEAT EXCHANGERS.
Hill, R. S.
DESCRIPTORS- (*TUBES, *Vibrations), (FLOW OF FLUIDS, Turbulent), (BOILERS, Tubes), (HEAT TRANSFER, Tubes),
IDENTIFIERS- TURBULENT EXCITATION, VORTEX SHEDDING, BOILER TUBE VIBRATIONS
CARD ALERT- 614, 631, 641
CODEN- TNEEAS SOURCE- Trans North East Coast Inst Eng Shipbuild v 92 n 4 Mar 1976 p 91-100
A description of the results of experiments on flow-induced excitation in cross-flow tube banks due to turbulent buffeting; narrow band excitation due to vortex shedding; excitation due to the presence of intense standing acoustic waves; and excitation involving fluid-elastic coupling between the flow and motion of a flexible tube. 12 refs.

ID NO.- EI760639619 639619
EFFECTS OF CATIONS ON BIOLOGICALLY ACTIVE SURFACES.
Blank, Martin; Britten, John S.
Columbia Univ, New York, NY
DESCRIPTORS- (*MEMBRANES, *Physical Chemistry), IONS, (SURFACE PHENOMENA, Physical Chemistry), CHEMICAL REACTIONS,
IDENTIFIERS- BIOLOGICAL MEMBRANES, CATIONS, ENZYMES
CARD ALERT- 631, 801, 802, 804, 931
CODEN- ADCSAJ SOURCE- Adv Chem Ser n 144 1975, for Mem Symp to N. K. Adam: Monolayers, 168th Meet of Am Chem Soc, Atlantic City, NJ, Sep 11-13 1974 p 231-23
The Na $SEM DASH$ K ATPase is a unique enzyme present in biological membranes that causes the transport of Na** $plus$ and K** $plus$ ions across the membrane when ATP is hydrolyzed. Results of an experimental study are presented which show that the divalent cations, Co**2** $plus$, Ni**2** $plus$, and Zn**2** $plus$, activate the Na $SEM DASH$ K ATPase in the presence of excess ATP. The characteristics of the activation are similar to those seen with the normal activation by Mg**2** $plus$ or Mn**2** $plus$. The activators are shown to be distinguished by a common range of ionic radii and by a tendency to form relatively fluid networks in protein monolayers. These results suggest that mechanical coupling between the two surfaces of the enzyme may be part of the mechanism linking ATP hydrolysis to Na** $plus$ and K** $plus$ ion transport. 18 refs.

ID NO.- EI760530730 630730
VOZDUSHNYE VYKLYUCHATELI SERII VNV NA 110-70 kV S NOMINAL'NYM TOKOM OTKLYUCHENIYA 40 kA. $left bracket$ 110-750 kV Aerial Switches of the VNV Series with 40 kA Nominal Disconnection Current $right bracket$.
Biryukov, S. V.; Buinov, A. L.; Dobrokhotov, R. B.; Mal'chukov, G. P.; Morozov, M. N.; Puzyriiskii, G. S.; Savinkov, Yu. T.; Chernov, Yu. P.
DESCRIPTORS- *ELECTRIC SWITCHES, ELECTRIC CIRCUIT BREAKERS, AIR BLAST,
CARD ALERT- 704, 706
CODEN- ELKTAQ SOURCE- Elektrotekhnika n 7 Jul 1975 p 11-14
The principles of design of a series of VNV-type air-brake switches with a large arc extinguishing module, the design of this module and the functioning of its mechanisms during the disconnect and connect operations are described. Results of supplementary investigation of 750 kV switches of the VNV type during commutation of an unloaded overhead power line are presented. A report is given on industrial manufacture of 330 and 750 kV VNV-type switches with the rated disconnection current of 40 kA by the Uralelektrotyazhmash production association. 11 refs. In Russian.

ID NO.- EI760425828 625828
NEPTUNE: A MODULAR SCHEME FOR THE CALCULATION OF LIGHT WATER REACTORS.
Kavenoky, A.
Cent d'Etud Nucl de Saclay, Gif sur Yvette, Fr
DESCRIPTORS- (*NUCLEAR REACTORS, *Computer Applications), CODES, SYMBOLIC, (DATA STORAGE UNITS, Computer Simulation),
CARD ALERT- 621, 723, 722
SOURCE- Comput Methods in Nucl Eng, Conf, Proc, Charleston, SC, Apr 15-17 1975 v 2 Sess V-A p 27-41. Publ by DuPont, Aiken, SC, 1975. Available from Natl Tech Inf Serv (CONF-750413), Springfield, Va
The APOLLO code is included in NEPTUNE for the multigroup transport treatment of cells, groups of cells and complete fuel assemblies; few groups cross section libraries are automatically transmitted to the reactor multidimensional diffusion modules. In the reactor phase, 10 and 20 diffusion calculations can be performed by use of the finite difference method; 2D and 3D calculations are done respectively by the BILAN and TRIDENT modules using the finite element method. For the depletion calculation coarse and refined computations are offered. NEPTUNE is characterized by two special features for the data processing: the OTCMAT system which provides a virtual memory simulation and the Intervention Monitor which allow to disconnect the computation modules and the control modules. 10 refs.

ID NO.- EI760422022 622022
CHOICE OF BLOOD-COAGULATION PARAMETERS FOR AUTOMATIC DIGITAL RECORDING.
Slesarenko, V. F.
All-Union Res Inst of Physicotech and Radiotech Meas, Moscow, USSR
DESCRIPTORS- (*BIOMEDICAL EQUIPMENT, *Instruments).
IDENTIFIERS- THROMBOELASTOMETERS, THROMBOELASTOGRAM
CARD ALERT- 462, 943
CODEN- BIOEAF SOURCE- Biomed Eng (NY) v 9 n 3 May-Jun 1975 p 132-135

A graph of the process of blood clotting as a function of time (throboelastogram) is shown and characterized. From this, there are considered which parameters are suitable for constructing a digital thromboclastometer. It is concluded that to obtain sufficiently full characteristics of the state of the blood-clotting system the digital thromboelastometer must contain computer units for measuring and calculating indices determining the parameters of coagulation: r, a//m, V//m, and S. Parameter r is the latent coagulation reaction; a//m is the maximum ordinate of the thromboelastogram; V//m is the maximum velocity of the coagulation process; S is the integral assessment (area under the curve). A significant increase in the accuracy of calculation of the integral assessment S, which is already used in diagnosis, can be achieved by introducing a device into the circuit of the digital thromboelastometer to disconnect the measuring circuit when the blood-clotting process has reached its maximum. 6 refs.

ID NO.- EI760320685 620685
TECHNIQUE FOR ACOUSTIC SURFACE STUDIES OF NONPIEZOELECTRIC MATERIALS.
Rockwell, D. A.; Parks, J. H.
Univ of South Calif, Los Angeles
DESCRIPTORS- *SURFACE PHENOMENA, ACOUSTIC WAVES, LASER BEAMS,
CARD ALERT- 744, 751, 931
CODEN- JAPIAU SOURCE- J Appl Phys v 46 n 12 Dec 1975 p 5088-5091

A technique is described for fluid coupling acoustic surface waves onto an arbitrary nonpiezoelectric material to allow the study of its surface properties. In these surface studies the relevant experimental information is contained in an induced phase change of the acoustic wave. For this reason, the primary concern was to develop a reliable technique by which this phase could be transmitted through the fluid interface. A simple physical model of the coupling mechanism is given, followed by a detailed description of the apparatus and procedure. Experimental studies of the phase change using the fluid-coupling technique are compared with results obtained by direct surface-wave excitation with interdigital ttransducers. An example of the application of this technique to alkali-halide surface absorption of CO//2 laser radiation is presented. 13 refs.

ID NO.- EI760318189 618189
O PRINTSIPE GAUSSA I URAVNENIYAKH DVIZHENIYA MEKHANICHESKIKH SISTEM S LYUBYMI SVYAZYAMI. $left bracket$ Gauss Principle and Equations of Motion of Mechanical Systems with Any Couplings $right bracket$.
Shan', Do
Hanoi Polytech Inst, Viet Nam
DESCRIPTORS- *MECHANISMS, STATISTICAL METHODS, SYSTEMS SCIENCE AND CYBERNETICS,
CARD ALERT- 601, 922, 731
CODEN- PKMKAL SOURCE- Prikl Mekh v 11 n 7 Jul 1975 p 89-97

The Gauss principle is formulated for the motion of systems with any couplings and equations of motion are set up in four forms. These equations are of practical significance for nonholonomous systems with linear and nonlinear higher-order couplings. An example is presented illustrating application of the equations obtained. In Russian.

ID NO.- EI760315034 615034
CAPACITOR, APPLICATION AND DESIGN.
Cooper, G.; Brecknell, W. A.
Natl Coal Board, South Notts, Engl
DESCRIPTORS- *CAPACITORS,
CARD ALERT- 704
CODEN- MNGTB7 SOURCE- Min Technol v 57 n 659 Sep 1975, 10 p between p 326 and 338

This paper was motivated by the more troublesome installations and in particular as a result of tests carried out on a rectifier winder. From tests carried out it would appear that problems with excess current and voltages at high frequencies can occur on a system when capacitors are associated with circuits in the following forms: (1) Isolated with high inertia drives on motors connected to a system through a fluid coupling. (2) Switching capacitors on to a feeder associated with a reactor. (3) Switching a capacitor on to a system with capacitors already energised. 4 refs.

ID NO.- EI760213837 613937
MECHANICAL RESPONSE AND THERMAL COUPLING OF METALLIC TARGETS TO HIGH-INTENSITY 1. 06 mu LASER RADIATION.
Hettche, L. R.; Stegman, R. L.; Tucker, T. R.; Metz, S. A.; Schriempf, J. T.
NRL, Washington, DC
DESCRIPTORS- (*TITANIUM AND ALLOYS, *Irradiation), (ALUMINUM AND ALLOYS, Irradiation), (LASER BEAM, Effects).
CARD ALERT- 541, 542, 744
CODEN- ASMSA4 SOURCE- ASME Pap n 75-WA/HT-40 for Meet Nov 30-Dec 4 1975, 11 p
Mechanical response and thermal coupling measurements are reported for aluminum and titanium targets exposed to high-intensity 1. 06 mu laser radiation. Measurements are made in air and vacuum for pulse lengths from 1 to 100 microseconds, providing incident fluences of between 10**6 and 10**8 watts/sq cm. Total momentum delivered to the target and time-resolved pressure developed over the target surface were measured at irradiances spanning the threshold for laser-supported detonation (LSD) wave ignition. The slope of the Impulse/Energy ratio shows a marked discontinuity at LSD threshold intensity. Peak target surface pressure is found to increase as 2/3 power of the beam intensity in agreement with the hydrodynamic model of LSD wave propagation. 29 refs.

ID NO.- EI760102900 602900
HYDRODYNAMIC INSTABILITY IN A POROUS LAYER SATURATED WITH A HEAT GENERATING FLUID.
Kulacki, F. A.; Ramchandani, R.
Ohio State Univ, Columbus
DESCRIPTORS- (*HEAT TRANSFER, *Porous Materials).
CARD ALERT- 641
CODEN- WASBBW SOURCE- Waerme Stoffuebertrag Thermo Fluid Dyn v 8 n 3 1975 p 179-185
Critical Rayleigh numbers determined by linear stability theory are presented for porous-fluid layers of infinite horizontal extent heated internally by a uniform volumetric energy source in the fluid. The thermal coupling between the layer and its environment is represented by a general mixed boundary condition for both the conduction state and the disturbance temperature. Rigid-rigid, rigid-constant pressure, and constant pressure-rigid boundaries are considered in the computations. 12 refs.

ID NO.- EI760100143 600143
COUPLING LAYERS FOR EFFICIENT WEDGE TRANSDUCERS.
Bertoni, Henry L.
Polytech Inst of New York, Brooklyn, NY
DESCRIPTORS- *ACOUSTIC TRANSDUCERS, ACOUSTIC WAVES.
IDENTIFIERS- ACOUSTIC SURFACE WAVES
CARD ALERT- 751, 752
CODEN- IESUAU SOURCE- IEEE Trans Sonics Ultrason v SU-22 n 6 Nov 1975 p 421-430
Two methods of controling the perturbation by limiting the mechanical coupling between the wedge and substrate are discussed for the case of Rayleigh waves. One method employs a layer of a compliant material, such as plastic, epoxy, or indium between the wedge and substrate and is found to be effective for a wide range of substrates. These layer materials have the additional advantage of serving to bond the wedge to the substrate. The second method for controling the coupling employs a layer in which the fields are evanescent. This method is limited to relatively dense substrates and involves a more difficult fabrication, although it offers the advantage of extremely wide band performance. The characteristics of both types of layer materials are illustrated by computing the leaky-wave characteristics, as well as the design and performance of wedge transducers, for various combinations of wedge, layer, and substrate materials. 11 refs.

ID NO.- EI751281534 581534
BRITISH EXPERIENCE WITH FIRE RESISTANT FLUIDS IN THE MINING INDUSTRY.
Hall, J. B.; Knight, G. C.; Kenny, P.
Natl Coal Board, Min Dep Headquarters, Doncaster, Yorkshire, Engl
DESCRIPTORS- (*HYDRAULIC FLUIDS, *Flammability).
CARD ALERT- 632
SOURCE- Fluid Power Equip in Min Quarrying and Tunnelling, Conf, Proc, London, Engl, Feb 12-13 1974 Pap C32/74 p 137-144. Publ by Inst of Mech Eng (CP3-1974), London, Engl, 1974
The application of fire-resistant fluids is often limited by the lubricating characteristics of the fluids and progress has been made in assessing these properties. Performance testing of machines has established the useful range of applications in many practical situations and has allowed operational problems to be anticipated and overcome. Recommendations made from the results of laboratory testing have allowed steady progress in increasing the utilisation of fire-resistant fluids underground. The success in the implementation of the Board's policy may be judged by the fact that all 726 powered roof support installations in the industry are operating on dilute emulsion; 12166 of 12476 fluid couplings are working on either non-toxic phosphate ester or water and 3237 of 3459 hydrostatic transmissions underground are working on invert emulsion. 11 refs.

ID NO.- EI751173252 573252
LOOSE TUBE SPLICES FOR OPTICAL FIBERS.
Miller, Calvin M.
Bell Lab
DESCRIPTORS- *FIBER OPTICS.
CARD ALERT- 741
CODEN- BSTJAN SOURCE- Bell Syst Tech J v 54 n 7 Sep 1975 p 1215-1225

A technique for splicing optical fibers has been developed that uses a self-aligning square cross-section tube, with inner dimensions slightly larger than the optical fiber. A total loss of 0. 58 db was obtained for eight splices connected in series using a graded-index fiber with a 68- mu m core diameter. The splices were made one at a time without the use of microscopes or micromanipulators; however, the fabrication process could be mechanized and extended to groups of fibers. A holding fixture could be added to adapt this technique to a connect-disconnect type splice. The size of the splice is presently 0. 012 in. square, making it suitable for use within cables. Measurement set refinements that were needed to measure individual splice losses as low as 0. 05 db include an improved detector and means for better control of launching conditions.

ID NO.- EI751171381 571381
POSITIVE-LOCKUP TORQUE CONVERTERS.
Givens, Larry
DESCRIPTORS- *AUTOMOBILE TRANSMISSIONS, TORQUE CONVERTERS, FUEL ECONOMY.
CARD ALERT- 602, 661, 521
CODEN- AUEGBB SOURCE- Automot Eng v 83 n 8 Aug 1975 p 30-33

Torque converters, like any fluid coupling, inherently involve slippage. Moreover, any converter multiples torque efficiently over only a certain usable speed range. For optimum fuel economy under all conditions, a four-speed automatic transmission with positive converter lockup in second, third, and fourth speeds would be ideal. Developmental work on this type of converter for automotive applications is presently in progress.

ID NO.- EI751170981 570981
PULSE-ECHO METHOD OF INVESTIGATING THE PROPERTIES OF MECHANICAL RESONATORS.
Bell, J. F. W.; Johnson, A. C.; Sharp, J. C. K.
Univ of Aston, Birmingham, Engl
DESCRIPTORS- *ACOUSTIC RESONATORS.
CARD ALERT- 752
CODEN- JASMAN SOURCE- J Acoust Soc Am v 57 n 5 May 1975 p 1085-1093

A general theory is developed for the properties of a vibrational sensor that acts as an acoustic resonator when driven remotely by a wire line carrying bursts of longitudinal plane waves of strain. The theory applies to an extended object having an arbitrary pattern of resonant frequencies, internal energy losses, and mechanical couplings to the line. The theory is used to relate experimental expressions of the spectra of isotropic disks of a variety of materials to recent theoretical studies. Accurate values of elastic constants and their temperature coefficients are obtained.

ID NO.- EI750959625 559625
FINAL CONNECTION: SOCKETS OR SOLDER?
Gove, John
Amphenol Ind Div, Chicago, Ill
DESCRIPTORS- (*INTEGRATED CIRCUITS, *Soldering), ELECTRIC CONNECTORS.
CARD ALERT- 538, 713, 714
CODEN- MADEAP SOURCE- Mach Des v 47 n 16 Jun 26 1975 p 39-41

A useful rule of thumb in attempting to decide whether to hard-wire or use a socket to connect printed circuit boards is circuit reliability $SEM DASH$ the more reliable the components the less probability of having to disconnect in order to test or repair a PC board. Sockets, however, can speed up production, reduce repair time, and provide the flexibility some systems demand.

ID NO.- EI750853861 553861
DYNAMIC RESPONSES OF TWO PARALLEL CIRCULAR CYLINDERS IN A LIQUID.
Chen, Shoei-Sheng
Argonne Natl Lab, Ill
DESCRIPTORS- (*NUCLEAR REACTORS, *Vibrations), (HEAT EXCHANGERS, Vibrations),
CARD ALERT- 621, 931
CODEN- ASMSA4 SOURCE- ASME Pap n 75-PVP-1 for Meet Jun 23-27 1975, 6 p

The problem of two parallel circular cylinders vibrating in a liquid is studied analytically. First, the equations of motion including fluid coupling are derived using the added mass concept. Then, a closed form solution and an approximate solution are obtained for free vibration. Finally, the steady-state responses of two cylinders subjected to harmonic excitations are presented. The results of this study illustrate the significance of the interaction of two structures in a liquid. 7 refs.

ID NO.- EI750852045 552045
HISTORIC SYNOPSIS OF FLUIDIC AND FLUID LOGIC HARDWARE.
Gau, L. P.
Chrysler Corp
DESCRIPTORS- •FLUIDIC DEVICES, (LOGIC DEVICES, Fluidic Elements),
CARD ALERT- 632, 721
CODEN- FLQUA2 SOURCE- Fluid Q v 6 n 4 Oct 1974 p 17-23
Examples of fluidic devices developed by various organizations around the world are given. Comments about the development of fluidics and fluid logic are given together with a listing of some of the active companies in the field. 19 refs.

ID NO.- EI750850591 550591
QUICK-CONNECT PIPE CUTS INSTALLATION COSTS AT BARNES & TUCKER MINES.
Anon
DESCRIPTORS- (•COAL MINES AND MINING, •Piping Systems), PIPE, PLASTIC,
CARD ALERT- 503, 619, 817
CODEN- COAAAK SOURCE- Coal Age v 80 n 7 Jun 1975 p 102-104
A lightweight but extremely rugged fiberglass/epoxy pipe with a quick-connect feature is used in both the drainage system and the fresh water supply system at four Pennsylvania coal mines. The quick-connect featu es gives strong, leakproof connections in pipe sections in as little as 30 sec, thus substantially reducing installation time and costs. The system is also quick to disconnect, making repairs or re-routing simple. The epoxy resin-rich interior of each pipe is a special corrosion-resistant formulation.

ID NO.- EI750748328 548328
EQUIPMENT FOR HANDLING THE ULTRADEEP WATER SPREAD MOORING SYSTEM.
Childers, Mark A.
ODECO, Inc, New Orleans, La
DESCRIPTORS- (•SHIPS, •Mooring),
CARD ALERT- 671
CODEN- PENGA6 SOURCE- Pet Eng v 47 n 5 May 1975, 9 p between p 114 and 132
This article focuses on two distinct types of combination wirerope/chain system (CWCS): the Disconnect System and the Non-disconnect System. The former uses off-the-shelf deck machinery and requires considerably less structural support than the non-disconnect system. The non-disconnect system allows all operations to be completed without disconnecting any portion of the entire mooring line length. A unique feature of the non-disconnect system is the use of a chain locker sheave and an interconnection assembly which can be passed over the wildcat without damage to any of the components. The non-disconnect system requires synchronization and orientation of chain in the wildcat in the haul-in mode while under high tensions.

ID NO.- EI750747116 547116
PARALLEL THINNING OF BINARY PICTURES.
Arcelli, C.; Cordella, L.; Levialdi, S.
Cons Naz delle Ric, Naples, Italy
DESCRIPTORS- •PATTERN RECOGNITION SYSTEMS,
CARD ALERT- 723
CODEN- ELLEAK SOURCE- Electron Lett v 11 n 7 Apr 3 1975 p 148-149
Sticklike figures can be obtained through the sequential application of a set of eight masks, of which each is applied in parallel. During the process, components neither disconnect nor vanish. Particular emphasis is given to the simplicity and speed of the algorithm when implemented on a parallel machine. 5 refs.

ID NO.- EI750744343 544343
CONSIDER HOLLOW-ROTOR MOTORS.
Mazurkiewicz, John
Honeywell, Freeport, Ill
DESCRIPTORS- •ELECTRIC MOTORS, DC,
IDENTIFIERS- HOLLOW ROTOR MOTORS
CARD ALERT- 705
CODEN- ELODAW SOURCE- Electron Des v 23 n 11 May 24 1975 p 76-79
In hollow-rotor designs, the armature-coil wire is wound to form a cylindrical shell, which is then reinforced with glass yarn, coated with an epoxy resin and cured. The hollow, or basket, rotor now rotates about the iron, not with it. The resulting hollow-rotor design improves acceleration at least tenfold compared to conventional electric motors constructed with copper windings set into slots of an iron core. With low-inertia rotors, the motor, by itself, can quickly accelerate or decelerate loads, such as in tape transports, printers and other servo applications; therefore, no longer are clutches and brakes needed to disconnect or connect the load to a continuously running motor. Hollow-rotor designs are limited to motors with less than about 0. 5 hp.

ID NO.- EI750743819 543819
NEW STARTING FLUID FLYWHEEL.
Berman, V. M.
DESCRIPTORS- (*COUPLINGS, *Hydraulic), (MACHINERY, Electric Drive).
CARD ALERT- 602, 632, 601, 705
CODEN- RENJA3 SOURCE- Russ Eng J v 54 n 8 1974 p 34-35

The drives of certain machines (belt and plate conveyors, textile machinery etc.) are required to start smoothly so as to control the acceleration within certain limits or to ensure the required length of time to speed-up the driven part of a machine. With these requirements in mind, a new starting fluid flywheel has been developed. The flow passage of the fluid coupling is a chamber formed by the symmetrical impellers of pump and turbine which have an enlarged inside radius. Research has shown that the enlargement of the inside radius R of the working chamber to R $equals$ 0.62R//a (where R//a is the active radius of the working chamber), with a simultaneous increase of the number of blades, while only slightly lessening the energy capacity of the fluid flywheel under working conditions (a slip of 3-4%), will substantially reduce its overload capacity at higher slips. Apart from this, there is a greater stability of the circulating flow in such a chamber. The possible appearance of internal hydraulic oscillations, and therefore of fluctuations in torque and speed, which are characteristic for conventional fluid couplings controlled by filling, is also eliminated. It is shown by a typical oscillogram that the acceleration of the power-operated machine under load starts, in fact, after the drive motor has reached a speed close to nominal. 3 refs.

ID NO.- EI750642065 542065
HYDRAULIC STARTING GEAR FOR PUMP/TURBINES.
Wolff, Norbert
Siemens, Erlangen, Ger
DESCRIPTORS- (*TURBOMACHINERY, *Starting).
CARD ALERT- 617, 632
CODEN- SZTEA6 SOURCE- Siemens Rev v 42 n 2 Feb 1975 p 74-77

This article deals with the suitability of impulse and Francis turbines for starting pump/turbines in pumping operation. The question of whether upstream-side globe valves are suitable for controlling the starting torque of Francis turbines with fixed guide vanes is discussed and reference is made to the more convenient control of the pump/turbine counter-torque by varying the guide vane position. By reference to an electrohydraulic starting method employed in the 1950s, the author then points out the advantages of a fluid coupling used in conjunction with an electric motor for starting a pump/turbine set under the more exacting conditions of pumping. 2 refs.

ID NO.- EI750641805 541805
PUSH-BUTTON TELEPHONES.
Card, S. E.; Littlemore, D. T.
DESCRIPTORS- (*TELEPHONE, *Push Button Systems), TELEPHONE EXCHANGES.
CARD ALERT- 718
CODEN- POEJA6 SOURCE- Post Off Electr Eng J v 67 pt 4 Jan 1975 p 224-231

A range of push-button telephone instruments, known commercially as Keyphones, has been developed to function with 3 different local signaling systems: multi-frequency, dc code C and loop-disconnect. The use of multi-frequency and dc code C signaling instruments is, at present, confined to those PABX's which are equipped with the appropriate signaling capability. Loop-disconnect signaling instruments, of which certain types are on trial, enable push-button signaling facilities to be offered to customers on public exchanges. 4 refs.

ID NO.- EI750531604 531604
DESIGN SYNTHESIS OF SAFETY DEVICES ON A LOGGING TRAILER $EM DASH$ 1.
Bhushan, Bharat; Feder, K. R.
Automot Spec, Denver, Colo
DESCRIPTORS- *LOGGING, (TRAILERS, Accident Prevention), (TRACTORS, Safety Devices).
IDENTIFIERS- LOGGING TRAILER, DECOUPLING DEVICES
CARD ALERT- 663, 821
CODEN- ASMSA4 SOURCE- ASME Pap n 75-DE-54 for Meet Apr 21-24 1975, 9 p

A safety device is proposed which enables the driver to dump the loaded trailer in case of the emergency. The proposed device is supposed to perform the following operations in sequence: It will disconnect the cup and saucer assembly. It will apply the emergency brakes to stop the decoupled trailer. It will drop the scotch block skid-plates in front of the duals of the trailer in order to avoid any skidding on a slippery road. The device is inoperative at speeds over 45 mph (72 km/hr) to insure that the driver cannot use it on highways. A thermodynamic analysis, for propagation of a real gas from a high pressure gas tank to two variable volume cylinders with movable pistons, is proposed to calculate the time required to perform these operations. 6 refs.

ID NO.- EI750423499 523499
DESIGN MAINTAINABILITY INTO EQUIPMENT.
Goldstein, Siegfried
AIL Div of Cutler-Hammer, Deer Park, NY
DESCRIPTORS- (*ELECTRONICS PACKAGING, *Maintainability).
CARD ALERT- 715, 716, 913
CODEN- ELODAW SOURCE- Electron Des v 23 n 4 Feb 15 1975 p 70-74

Some basic guidelines for the design of maintainable equipment are given. Suggestions are given to: use quick disconnect latches, steep angle screws and any other type of retainer that reduces access time to internal components; break the circuitry up into small functional building blocks, and position test points to allow for branching; place the subsections that are most likely to fail closest to the repair openings; and give preference to simpler packaging to allow easy access to circuit boards, mechanical assemblies and test points.

ID NO.- EI750423329 523329
SURGE-SUPPRESSING RESISTORS APPLIED TO EHV DISCONNECT SWITCHES.
Lott, Donald L.
DESCRIPTORS- (*ELECTRIC SWITCHGEAR, *Surge Protection), (RESISTORS, Testing).
CARD ALERT- 704, 706, 942
CODEN- ACERBK SOURCE- Allis-Chalmers Eng Rev v 40 n 1 1975 p 24-27

As transmission voltages have increased, surge resistors have been added to circuit breakers and disconnect switches to limit switching transients. The most common applications of surge resistors to disconnect switches have been for deenergizing bus and short line sections at 345 and 500 kV. Without resistors, severe stresses can be imposed on lightning arresters and terminal equipment by line-to-neutral crest voltages ranging from 2. 0 to 2. 5 per unit (pu), where the base for the pu value is nominal crest line to ground voltage. Multiple sparkovers exceeding arrester ratings have been recorded. Surge voltages can also be induced in adjacent low-voltage power and control circuits with the possibility of causing equipment failure. Usually, the value of resistance is selected to limit the switching-surge voltage to less than 1. 8 pu. Resistance values three to five times the system surge impedance have become somewhat of an industry standard. A typical surge resistor consists of a 500- $OMEGA$ Nichrome resistor element wound on an epoxy core mandrel and silver brazed to bronze end inserts. This assembly is encapsulated in the same epoxy, then put in a porcelain housing for environmental protection. The top end cap is sealed to the mounting flange and the bottom cap is relieved to permit breathing action. This construction provides a totally encapsulated resistor and permits re-coring. 3 refs.

ID NO.- EI750318799 518799
SEPARABLE FLUID CONNECTOR SYSTEM EFFECTIVENESS EVALUATION TECHNIQUE.
Prasthofer, W. P.; Wyskida, R. M.
Marshall Space Flight Cent, Huntsville, Ala
DESCRIPTORS- (*PIPE FITTINGS, *Mathematical Models), (SPACE VEHICLES, Computer Applications).
IDENTIFIERS- SEPARABLE BOLTED FLUID CONNECTORS, OPTIMIZATION
CARD ALERT- 619, 655, 723
CODEN- ASMSA4 SOURCE- ASME Pap n 74-WA/PVP-9 for Meet Nov 17-22 1974, 12 p

An analytical technique is presented for evaluating the relationship among existing numerous separable fluid connector designs to find that configuration which is best (optimal). The data utilized in this research was acquired from approximately 900 flanges designed for six sub-systems of the S-1B stage of the Saturn 1B Space Vehicle. The method is general enough to be useful in optimizing design and systematizing decision-making in a variety of related technical fields. 5 refs.

ID NO.- EI750317603 517603
IN SITU GROWN EUTECTIC MAGNETOELECTRIC COMPOSITE MATERIAL.
Van Run, A. M. J. G.; Terrell, D. R.; Scholing, J. H.
Philips Res Lab, Eindhoven, Neth
DESCRIPTORS- *MAGNETOELECTRIC EFFECTS, PIEZOELECTRIC MATERIALS.
CARD ALERT- 701, 708, 712
CODEN- JMTSAS SOURCE- J Mater Sci v 9 n 10 Oct 1974 p 1710-1714

A eutectic composite material with the mixed spinel cobalt ferrite-cobalt titanate and the perovskite barium titanate as co-existing phases has been prepared, which shows a magnetoelectric effect due to the mechanical coupling of the piezomagnetic spinel and the piezoelectric perovskite. The maximum value of the magnetoelectric effect $DELTA$ E/ $DELTA$ H obtained up till now is 5. 0 $multiplied by$ 10** $minus$ **2 V cm** $minus$ **1 Oe** $minus$ **1 at room temperature. 10 refs.

ORIGINAL PAGE IS OF POOR QUALITY

ID NO.- EI750106175 506175
GAS SHROUDING OF STRAND CAST STEEL AT JONES & LAUGHLIN STEEL CORPORATION.
Samways, N. L.; Pollard, B. R.; Fedenko, D. J.
Jones & Laughlin Steel Corp, Aliquippa Works, Pa
DESCRIPTORS- (*STEELMAKING, *Quality Control).
CARD ALERT- 545, 913
CODEN- JOMTAA SOURCE- J Met v 26 n 10 Oct 1974 p 28-34

A considerable improvement in steel cleanliness was realized by protecting the tundish stream from atmospheric oxidation with refractory tube shrouds. Advantages include the ability to establish good casting conditions on all strands prior to the start of shrouding. This permits the use of unstoppered metering nozzles with the capability both of clearing initially frozen nozzles and dressing the nozzle to improve stream characteristics. Shrouds can be removed and reintroduced following temporary strand stoppage for minor equipment problems such as slow dummy bar disconnect, straightner and cut-off operation. The metal stream and mold metal level are visible at all times to the caster and permits corrective action if required. Product quality is fully comparable to ingot steel. 11 refs.

ID NO.- EI750102133 502133
SECONDARY SUBS: A GROWING ROLE.
Anon
DESCRIPTORS- *ELECTRIC SUBSTATIONS, TRANSFORMER.
CARD ALERT- 706
CODEN- POWEAD SOURCE- Power v 118 n 11 Nov 1974 p 21-23

The secondary substation is the point where in-plant distribution voltage is brought to utilization values. The ever-widening choice of variables from incoming disconnect and transformer to low-voltage breakers are highlighted in this article.

ID NO.- EI741280529 480529
DUAL HYDRAULIC SYSTEM POWERS BLAST HOLE DRILL.
Deyo, Bruce
Marion Power Shovel Co, Ohio
DESCRIPTORS- (*ROCK DRILLS, *Hydraulic), HYDRAULIC DRIVE.
IDENTIFIERS- DRILL PIPE
CARD ALERT- 405, 502, 632
CODEN- HYDPAZ SOURCE- Hydraul Pneum v 26 n 7 Jul 1973 p 71-74

Hydraulic system described provides drill with high force necessary for drilling, plus provides power to stabilize the drill and to handle, connect, and disconnect lengths of drill pipe. Diversion valve in closed-loop circuit connects fluid motors in series or parallel.

ID NO.- EI741279741 479741
MECHANICAL AND OPTICAL COUPLING OF A THOMSON SCATTERING LASER T//e MEASUREMENT TO THE ORMAK MACHINE.
Culver, J. S.; Murakami, M.
Oak Ridge Natl Lab, Tenn
DESCRIPTORS- (*PLASMAS, *Diagnostics), (LASER BEAMS, Applications), (NUCLEAR REACTORS, Fusion), (LIGHT, Scattering).
IDENTIFIERS- ORMAK FUSION DEVICES
CARD ALERT- 621, 741, 744, 932
SOURCE- Symp on Eng Probl of Fusion Res, 5th, Proc, Princeton Univ, NJ, Nov 5-9 1973 p 398-402. Publ by IEEE Nucl and Plasma Sci Soc, Available from IEEE (73CH0843-3-NPS), New York, 1974

A combination laser, spectrometer device has been constructed to observe the electron density and temperature of the ORMAK plasma by Thomson scattering in the range of 50 eV-2 keV. The apparatus can observe the plasma at six radial positions and fire four 30 nanosecond pulses of Q switched ruby laser light during an ORMAK shot. The apparatus and some of its optical components are described. 1 ref.

ID NO.- EI741276631 476631
SOME SPECIAL DESIGN CONSIDERATIONS FOR A MECHANICAL FILTER CHANNEL BANK.
Albsmeier, Hans; Guenther, Alfhart E.; Volejnik, Wilhelm
Siemens, Ger
DESCRIPTORS- *ELECTRIC FILTERS, ELECTROMECHANICAL, TELEPHONE CIRCUITS.
IDENTIFIERS- CHANNEL FILTERS
CARD ALERT- 713, 718
CODEN- IECMBT SOURCE- IEEE Trans Commun v COM-22 n 7 Jul 1974 p 935-940

The technical concept realized by the channel bank is optimum with respect to a variety of requirements. Considerations of size and fabrication technology recommend a frequency of 50 kHz for the mechanical filter. The general concept of the modulator suggests a filter design with tuned conventional transformers. Since subsequent adjustment of the assembled mechanical part of the filter is undesirable, the provision of finite attenuation poles has been abandoned at the expense of adding two extra resonators. The design imposes only modest demands as to the reproducibility of the mechanical couplings. By tuning the transformers it is possible to correct minor production tolerances. A special design of the channel and associated signal filter results in a very low temperature dependence and permits the connection of both filters directly in parallel. 9 refs.

ID NO.- EI741174039 474039
84A SINGLE CHANNEL STATION CARRIER SYSTEM.
Stewart, James A.
DESCRIPTORS- •TELEPHONE, CARRIER.
CARD ALERT- 718
CODEN- GTEABI SOURCE- GTE Autom Electr Tech J v 14 n 3 Jul 1974 p 135-142

A carrier system is described which was designed to have cost and performance parameters competitive with paired cable for a majority of new subscriber loops. The system design incorporates a number of unique features, not provided by previous single channel systems, which are necessary for permanent service applications. These include: bridged ringing with ring-trip during ringing, central office power for the station terminal with disconnect during off-hook, dialing, or ringing on the physical channel, and transmission suppression of ringing signals below a set threshold. Electrical design and the packaging concepts are discussed. Typical performance characteristics are listed.

ID NO.- EI741172267 472267
REPAIR OF OFFSHORE PIPELINES IN WATER DEPTHS TO 3,000 FEET.
Hemphill, D. P.; Milz, E. A.; Luke, R. R.
Shell Dev Co
DESCRIPTORS- (•PIPELINES, •Offshore), SUBMERSIBLES.
IDENTIFIERS- REPAIR/CONNECTION SYSTEMS
CARD ALERT- 472, 512, 619, 674
SOURCE- Offshore Technol Conf, 6th, Annu, Prepr, Pap, Houston, Tex, May 6-8 1974 v 1, Pap 1939, p 55-64. Publ by Offshore Technol Conf, c/o David L. Riley, Dallas, Tex

Describes a new concept for the repair or connection of large diameter submarine pipelines beyond the practical working depth of divers. A repair/connection tool system is incorporated into an unmanned controlled buoyancy vehicle, powered through an umbilical cable from a surface vessel selected for local sea conditions. The need for heavy lift capability is eliminated since the vehicle rests on bottom while working. Repair is accomplished by replacing a section of pipeline with a new section including articulating means for accommodating misalignment of the damaged pipe cut ends, and mechanical couplings having longitudinal adjustment capacity. 2 refs.

ID NO.- EI741066816 466816
PIEZOELECTRIC TRANSDUCERS WITH A FACE PLATE.
Pajewski, W.
Inst of Fundam Technol Res, Warsaw, Pol
DESCRIPTORS- •ULTRASONIC TRANSDUCERS, PIEZOELECTRIC TRANSDUCERS.
CARD ALERT- 753, 704
SOURCE- Ultrason Int, Conf Proc, Imp Coll, London, Engl, Mar 27-29 1973 p 303-308. Publ by IPC Sci and Technol Press Ltd, Guildford, Surrey, Engl, 1973

Electrical to acoustical energy conversion in transducers consisting of a piezoelectric ceramic and metal front plate is considered when the lateral dimensions of the transducer is of the order of a few wavelengths. Experiments were carried out with transducers radiating into water. It was found tat the power factor and the radiating resistance could be changed by adjusting the dimensions of the front plate. The results are also considered for the new piezoelectric materials which are characterized by a high-mechanical coupling factor. 9 refs.

ID NO.- EI741064479 464479
REPAIR OF SEISMIC DAMAGE TO ABOVEGROUND PIPELINES.
Miedema, Henry J.; Olson, John B.
Los Angeles Dep of Water and Power, Calif
DESCRIPTORS- (•PIPELINES, •Earthquake Resistance), PIPE JOINTS, PIPE, STEEL.
IDENTIFIERS- SEISMIC DAMAGE, AQUEDUCTS, PIPELINE TRANSPORTATION
CARD ALERT- 484, 545, 619
CODEN- TPEJAN SOURCE- ASCE Transp Eng J v 100 n TE3 Aug 1974 Pap 10756 p 733-742

The San Fernando Earthquake of February 9, 1971 caused severe damage to aboveground steel pipe sections of the two aqueducts serving Los Angeles. Repair to the facilities consisted of removal of buckled sections, installation of new saddle supports, replacement of mechanical couplings, and installation of rock anchors. Movement sensors were installed across mechanical couplings and load cells were attached to the rock anchors to measure changes in load. Recommendations are made to reduce potential seismic damage to aboveground pipelines.

ID NO.- EI740953610 453610
PRESSED POROUS NICKEL OXIDE CATHODE.
Rybas, K. P.; Pavlov, V. K.; Telepaev, B. N.
Sci-Res Inst of Electrophys Equip, Leningrad, USSR
DESCRIPTORS- •CATHODES.
CARD ALERT- 714
CODEN- INETAK SOURCE- Instrum Exp Tech v 16 n 6 Part 2 Nov-Dec 1973 p 1756-1758

The influence of the composition of the emitting tablet of a pressed porous nickel oxide cathode on the emission capacity in the pulsed operating mode and on the resistance to contamination by remanent gases in the pressure range 2 $multiplied by$ 10•• $minus$ ••6-1 $multiplied by$ 10•• $minus$ ••2 torr was investigated. The constructions of cathodes having a diameter of 5 to 50 mm for electron accelerators are described which have good mechanical and electrical coupling between the emitting tablet and the cathode core, a constant shape of the emitting surface in both the sintering and operating processes of the cathode: this facilitates stability of electron-beam focusing. 9 refs.

ID NO.- EI740852145 452145
SINGLE POINT MOORING SYSTEM.
Black, John
DESCRIPTORS- (*TANKERS, *Mooring), MARINE PLATFORMS,
IDENTIFIERS- SINGLE POINT MOORING
CARD ALERT- 671, 674
CODEN- MRERBJ SOURCE- Mar Eng Rev May 1974 p 28-29, 31-32
The design of the single point mooring system (SPM) must be such that it will facilitate, unassisted, safe berthing and unberthing of oil tankers and ore/slurry/oil vessels of large deadweight. These safe limits may be roughly delineated as follows $EM DASH$ for mooring 15 ft waves $EM DASH$ 25 knot winds: for unmooring 20 ft waves $EM DASH$ 45 knot winds. The advantages and disadvantages of the catinary chain leg buoy (SMB), the single anchor leg mooring (SALM), and the exposed location buoy (ELSBM) are described. A quick-disconnect self-sealing coupling and monitoring equipment for oil spills are also described.

ID NO.- EI740740572 440572
LOAD CAPACITY OF OUTDOOR AIR SWITCHES.
Turnbull, W. D.; Ashton, J. H.
Kearney Natl (Can) Ltd
DESCRIPTORS- *ELECTRIC SWITCHES,
CARD ALERT- 704
SOURCE- Can Electr Assoc, Eng and Oper Div, Trans, Toronto, Ont, Mar 26-30 1973 v 12, Part 1, Pap 73-A-61, 14 p. Publ by CEA, Montreal, Que, 1973
Some of the in-service factors which might impair or enhance, the load capacity of an outdoor switch are listed. The meaning and value of standards governing disconnect switches are discussed.

ID NO.- EI740637783 437783
SINGLE CHANNEL STATION CARRIER SYSTEM FOR PERMANENT SERVICE APPLICATIONS.
Stewart, James A.
GTE Lenkurt, Inc, San Carlos, Calif
DESCRIPTORS- *TELEPHONE SWITCHING EQUIPMENT,
CARD ALERT- 718
CODEN- IECMBT SOURCE- IEEE Trans Commun v COM-22 n 3 Mar 1974 p 312-319
The 84A station carrier system was designed to have cost and performance parameters competitive with paired cable for a majority of new subscriber loops. The system design incorporates a number of unique features, not provided by previous single channel systems, which are necessary for permanent service applications. These include: bridged ringing with ring-trip during ringing, central office power for the station terminal with disconnect during off-hook, dialing, or ringing on the physical channel, and transmission suppression of ringing signals below a set threshold. This paper describes the system and discusses the electrical design and the packaging concepts. Typical performance characteristics are listed.

ID NO.- EI740637397 437397
INELASTIC STRAINS FROM THERMAL SHOCK.
Houtman, J. L.
Westinghouse Electr Corp, Pittsburgh, Pa
DESCRIPTORS- (*STAINLESS STEEL, *Thermal Effects), (NICKEL AND ALLOYS, Thermal Effects), GRAPHIC METHODS,
IDENTIFIERS- THERMAL SHOCK, INELASTIC STRAINS
CARD ALERT- 545, 548, 902, 421, 531
CODEN- MADEAP SOURCE- Mach Des v 46 n 7 Mar 21 1974 p 190-194
Pumps, valves, piping, and heat exchangers $EM DASH$ among other components $EM DASH$ are often subjected to thermal shock so severe that strains move into the plastic range. Because stress is no longer linearly proportional to strain in this region, conventional stress equations are not valid. So stress analysis in the inelastic range usually requires costly time-consuming methods. A new graphical approach is presented which provides a simple way to predict inelastic stresses and strains for cylinders and plates, two structural shapes commonly encountered in fluid-transfer hardware. The method, developed initially to deal with thermal shock in nuclear reactors, has application far beyond reactor design and can be applied to any high-temperature component. The curves can be used to evaluate all annealed austenitic stainless steels, medium carbon steels in the normalized condition, as well as some of the high nickel alloys (Inconel) in the annealed condition. This approach is valid for cylinders exposed to thermal shock on one surface and insulated on the other, and also for any section with a through-thickness thermal gradient if the section is restrained fully against rotation at its boundaries $EM DASH$ for example, a circular plate with edges clamped against rotation. An example is worked out for a Type 304 stainless steel cylinder. 2 refs.

ID NO.- EI740636510 436510
HYDRAULISCHE ANFAHREINRICHTUNGEN FUER PUMPENTURBINEN. $left bracket$ Hydraulic Starting Gear for Pump Turbines $right bracket$.
Wolff, Norbert
DESCRIPTORS- (*PUMPS, TURBINE, *Hydraulic Drive).
CARD ALERT- 618, 632
CODEN- SIEZAB SOURCE- Siemens-Z v 48 n 2 Feb 1974 p 103-106

The article deals with the suitability of impulse and Francis turbines for starting pump/turbines in pumping operation. The question of whether upstream-side globe valves are suitable for controlling the starting torque of Francis turbines with fixed guide vanes is discussed and reference is made to the more convenient control of the pump/turbine counter-torque by varying the guide van position. By reference to an electrohydraulic starting method employed in the 1950s, the author then points out the advantages of a fluid coupling used in conjunction with an electric motor for starting a pump/turbine set under the more exacting conditions of pumping. 2 refs. In German with English abstract.

ID NO.- EI740633018 433018
CLUTCH AND BRAKE MOTORS.
Siegel, W. P.
Singer Co, Somerville, NJ
DESCRIPTORS- *ELECTRIC MOTORS, CLUTCHES, BRAKES, CLUTCHES, ELECTRIC, (COUPLINGS, Hydraulic).
IDENTIFIERS- CLUTCH AND BRAKE MOTORS, SPECIAL PURPOSE MOTORS
CARD ALERT- 705, 602, 632, 704
CODEN- MADEAP SOURCE- Mach Des v 46 n 9 Apr 11 1974 p 62-64

Clutch and brake motors combine a clutch and/or brake with a motor to which the clutch and brake are matched by the manufacturer, or individually selected and assembled into a drive unit by the user. Clutch-brake motors are generally used where load engagement, disengagement, or braking are frequent. They are used less often when stops and starts are infrequent, except where they must be very fast or where high-inertia loads must be started. The clutch permits the motor to be started before the load is engaged to avoid the high starting current that would be needed to simultaneously start both motor and high-inertia load. Brakes and clutches may be considered to have indentical characteristics because the brake is merely a clutch with one of the engaging elements anchored. Positive clutches (for low-inertia applications) and the more generally applicable friction, electric, and fluid clutches are described. Friction clutches may be actuated centrifugally, electrically, pneumatically or hydraulically. Electric clutches may be of the hysteresis or eddy-current type. Fluid clutches are of the preset, fixed-torque fluid-coupling type, and of course provide some shock-absorbing action between the load and the motor. Speed, power and duty-cycle requirements are discussed.

ID NO.- EI740530200 430200
METODA SIL DLA TERMO-LEPKOSPREZYSTYCH UKLADOW PRETOWYCH. $left bracket$ Method of Forces for Systems of Thermo-viscoelastic Rods $right bracket$.
Jedrzejczyk, Jadwiga
Slaska Polytech, Gliwice, Pol
DESCRIPTORS- (*STRESSES, *Thermal), MATHEMATICAL MODELS.
IDENTIFIERS- VISCOELASTICITY
CARD ALERT- 408, 921, 931
CODEN- RZINAZ SOURCE- Rozpr Inz v 21 n 2 1973 p 305-310

The equations of the method of forces for viscoelastic systems subject to the action of a non-stationary temperature field are presented. The solution is found within the framework of linear viscoelasticity, thermo-mechanical coupling effects being disregarded. Rheological properties of the material are assumed to be independent from the temperature. 8 refs. In Polish with English abstract.

ID NO.- EI740527903 427903
PLASTICITY OF IRRADIATED MATERIALS $EM DASH$ 1, 2.
Perzyna, P.
DESCRIPTORS- (*METALS AND ALLOYS, *Irradiation), PLASTICITY, THERMODYNAMICS.
CARD ALERT- 531, 622, 931
CODEN- BAPTA9 SOURCE- Bull Acad Pol Sci, Ser Sci Tech v 21 n 10 1973 p 499-513

The objective of this paper is to develop a physical theory of plasticity of irradiated materials. In the first part of the paper experimental results for irradiated materials are discussed and a simple physical model of time-dependent plastic flow is given. A mathematical structure of a thermodynamic theory of time-dependent irradiated materials is presented. It is shown to what extent thermodynamics help in the proper description of internal dissipation when both thermo-mechanical coupling and irradiation effects are taken into consideration. Analysis of thermomechanical coupling in the presence of irradiation effects is given. Assumptions under which the thermo-radiation process is completely decoupled from the mechanical state of the process are discussed. 35 refs.

ID NO.- EI740526160 426160
AMERICAN POWER CONFERENCE, PROCEEDINGS, VOLUME 35, 1973
Gross, Eric T. B.; Boulet, Lionel; Cloutier, Gilles-G.; Dupont, Andre; Magnien, Maurice; Pouard, Michel; Lageman, B.; Heberlein, Gustave E.; Carter, William A.; Huber, R. F.; Humphreys, David A.; Young, James B.; Campbell, Harold E.; Cameron, F. L.; Smith, D. R.
DESCRIPTORS- •ELECTRIC POWER GENERATION, ELECTRIC POWER DISTRIBUTION, ELECTRIC POWER TRANSMISSION.
CARD ALERT- 615, 706
SOURCE- Am Power Conf, Proc, 35th Annu Meet, Ill Inst of Technol, Chicago, May 8-10 1973 Available from IIT, Chicago, Ill, 1973, 1268 p
Following is a continuation of the list of titles and authors: Introductory Remarks $EM DASH$ EHV and UHV Systems Overseas. By Eric T. B. Gross. High Power Testing Laboratory of IREQ. By Lionel Boulet, Gilles-G. Cloutier and Andre Dupont. New High Power Laboratories at Les Renardieres. By Maurice Magnien and Michel Pouard. KEMA Commissions Its New High Power Laboratory. By B. Lageman. Electric High Power Research Laboratory. By Gustave E. Heberlein and William A. Carter. High-Voltage Laboratory at Woodstock. By R. F. Huber. Feasibility of Automatic Control of Distribution Class Disconnect Switches. By David A. Humphreys. Prevention of Harmonic and Ferroresonance Phenomena in Shunt Capacitor Applications. By James B. Young. Implication of Increased Short-Circuit Duty on Residential Distribution Systems. By Harold E. Campbell. Fused Distribution Limiter. By F. L. Cameron and D. R. Smith.

ID NO.- EI740420973 420973
TIME-DOMAIN MEASUREMENTS OF MICROWAVE COMPONENTS.
Cronson, Harry M.; Mitchell, Peter G.
Sperry Res Cent, Sudbury, Mass
DESCRIPTORS- (•MICROWAVE DEVICES, •Testing), ELECTRIC MEASUREMENTS, (ELECTRIC ATTENUATORS, Testing).
IDENTIFIERS- TIME DOMAIN MEASUREMENTS, INSERTION LOSS MEASUREMENTS
CARD ALERT- 714, 942
CODEN- IEIMAO SOURCE- IEEE Trans Instrum Meas v IM-22 n 4 Dec 1973 p 320-325
Recent advances in microwave component measurements using time-domain techniques are described. After reviewing the basic elements of a time-domain system, a substitution procedure is applied to determine the insertion loss of wide-band attenuators. Comparison of these measurements with frequency calibrations shows agreement to within 0. 1 db in 10 db for attenuators between 10-50 db, over the frequency range 0. 4-GHz. Error sources are resolved by experiments designed to isolate and evaluate various contributions including: random errors due to noise and drifts; systematic errors caused by substitution attenuator inaccuracies, line mismatch, deflection nonlinearities, and inaccurate time window widths; time-to-frequency translation errors of aliasing and truncation; and mechanical errors due to connect-disconnect cycles. Results show that random processes are responsible for most of the observed error. The reported measurements establish the calibration capabilities and the expected magnitude of individual system errors for the particular system tested.

ID NO.- EI740419385 419385
PHYSICAL DESIGN AND PACKAGING $EM DASH$ 3. AVOIDING THE NUTS & BOLTS.
Brooks, Phil
DESCRIPTORS- •ELECTRONICS PACKAGING.
CARD ALERT- 715, 716
CODEN- EDNSBH SOURCE- EDN v 18 n 19 Oct 5 1973 p 70-75
The use of metal spring clips, plastic snap-in devices, adhesive tapes, shrink tubing, and other fastening devices and materials for providing insulation, weatherproofing, quick disconnects and other multi-function or unusual tasks is discussed.

ID NO.- EI740418268 418268
SIMULATION OF THE NEUTRON DIFFUSION EQUATIONS OVER MANY DECADES.
Morehouse, Nye F. Jr.; Carter, Joseph C.; Bryant, Lawrence T.
Argonne Natl Lab, Ill
DESCRIPTORS- •COMPUTER PROGRAMMING, (NEUTRONS, Scattering), NUCLEAR REACTORS.
IDENTIFIERS- NEUTRON DIFFUSION
CARD ALERT- 621, 723, 932
CODEN- SIMUA2 SOURCE- Simulation v 20 n 1 Jan 1973 p 9-16
The simulation of a nuclear reactor system is described using the neutron diffusion equations coupled to the thermodynamic and mechanical equations. In this coupling, representation of the diffusion equation presents considerable difficulty when large power excursions are being simulated. In this article a transformation of the diffusion equations is developed which permits coupling them to mechanical and thermodynamic equations of much slower response times, thus eliminating the difficulties previously encountered in simulating these coupled sets of equations. 2 refs.

ID NO.- EI740417599 417599
INCREASED SEAT BELT USE AS A RESULT OF IMPROVED SEAT BELT SYSTEMS.
Appleby, M. R.; Bintz, L. J.
Automob Club of South Calif
DESCRIPTORS- (*AUTOMOBILES, *Seat Belts), HIGHWAY ACCIDENTS.
CODEN- SEPPAB SOURCE- SAE Prepr Pap 740048 for Meet Feb 25-Mar 1 1974, 6 p

A study was conducted to discover if the long-term effect of the lap belt reminder system on 1972 cars would be to increase belt-use frequency. Automobile Club of Southern California employees driving fleet vehicles equipped with specially designed hardware were used to perform the study. Driver lap belt usage was measured with the buzzer and light reminder system disconnected (to determine use rates under normal conditions) and then with operating (to determine use rates in response to the reminder system). Approximately one third of the individuals who did not use lap-belts will become users for the majority of vehicle trips when the reminder system is operative. The reminder system will also increase usage of lap belts by individuals who used them only on occasion. This study could not establish a significant relationship between lap belt use (with and without reminder system) and miles per vehicle trip, trips per day, and test subject demographics. Approximately one half of the individuals will circumvent the reminder system. The majority will manipulate the lap belts, not increasing lap belt use. The minority will disconnect the electrical system. Their subsequent behavior in terms of an increase, no change, or decrease in lap belt use may vary. 12 refs.

ID NO.- EI740314043 414043
RASCHET KOEFFITSIENTA POLEZNOGO DEISTVIYA MEKHANIZMOV. $left bracket$ Calculation of the Efficiency of Mechanisms $right bracket$.
Zubov, I. I.
DESCRIPTORS- (*MECHANISMS, *Mathematical Models), KINEMATICS, (MECHANICAL ENGINEERING, Design Aids).
CARD ALERT- 601, 931, 901
CODEN- IVUSAH SOURCE- Izv Vyssh Uchebn Zaved, Mashinostr n 11 1973 p 63-65

A method for the determination of the efficiency of mechanisms and mechanical systems with mixed coupling of elements (kinematic pairs or mechanisms) is considered. A general equation of energy balance is derived in relative coefficients. An analytical dependence is given for the determination of the efficiency of a system. The essence of the method presented consists in that any branching off of the flow of energy is evaluated by a relative coefficient. Relative coefficients for the power flow distribution, for the losses, and for efficiency are introduced. In Russian.

ID NO.- EI740312222 412222
GAS-INSULATED BREAKER DESIGNS SIMPLIFY INSTALLATION AND MAINTENANCE.
Harper, W. E.; Meinders, G. J.
DESCRIPTORS- (*ELECTRIC CIRCUIT BREAKERS, *Sulfur Hexafluoride).
CARD ALERT- 704, 914, 706
CODEN- ACERBK SOURCE- Allis-Chalmers Eng Rev v 38 n 3 1973 p 4-7

Two new SF//6 gas-insulated breakers, a mini-sub type and a free-standing type were designed to incorporate features which facilitate easy installation and maintenance. The structure of the gas-insulated breakers for application through 362 kV consists of a single, three-phase, grounded-tank breaker mounted on a common frame. For applications at 550 kV and above each phase unit is shipped as a separate module. Current transformers are normally included in the unit. In the case of the unit breaker module, disconnect and grounding switches may be included. The unit is assembled, adjusted and tested at the factory. Only installation of the bushings and a final checkout are required in the field. The breaker has been designed to permit all routine inspection and maintenance without opening the gas system of the breaker.

ID NO.- EI740311435 411435
SELECTIVE SHUNT CAPACITOR BANK PROTECTION.
Neumann, M. E.
DESCRIPTORS- (*CAPACITORS, *Relay Protection), ELECTRIC EQUIPMENT PROTECTION, OVERVOLTAGE PROTECTION, OVERCURRENT PROTECTION, SURGE PROTECTION,
IDENTIFIERS- CAPACITOR BANKS
CARD ALERT- 704, 706, 914
CODEN- ACERBK SOURCE- Allis-Chalmers Eng Rev v 38 n 3 1973 p 27-31
While shunt capacitor banks can be protected by several different methods, they must guard against four basic problems: overcurrent due to bus faults; surge voltages caused by lightning and switching transients; capacitor overcurrents; continuous capacitor overvoltages. If the breaker feeds only the shunt capacitor bank and overcurrent relays are installed close to the bank on the source side of the breaker, lightning and switching transient voltages must be curtailed with standard overvoltage protection. If it is the intention not to take a bank out of service when a single capacitor fails, the damaged capacitor must be isolated by a fuse which serves double duty as a protective device and a disconnect switch. Fuse coordination is important for reliable protection. Inrush and oscillatory switching transient currents must not cause the fuse to blow. In Y connected banks a voltage or current change can be detected either as a neutral unbalance for a disturbance in any of three phases, or it can be detected independently in each phase by a voltage comparison method. The voltage differential sensing method for shunt capacitor protection is more sensitive and reliable than neutral unbalance detection. Best protection results from the lowest possible number of series and parallel connected capacitors which provides largest sensing signals, easier fuse coordination and lower bank cost. 7 refs.

ID NO.- EI740210354 410354
DIAGNOSTIC STUDY OF BONDED, THICKNESS MODE TRANSDUCERS BY INPUT IMPEDANCE MEASUREMENT.
Noguchi, Toyota; Fukumoto, Akira
Matsushita Res Inst Tokyo, Inc, Kawasaki, Jap
DESCRIPTORS- *ULTRASONIC TRANSDUCERS,
CARD ALERT- 753
CODEN- IESUAU SOURCE- IEEE Trans Sonics Ultrason v SU-20 n 4 Oct 1973 p 365-370
The operation of a bonded thickness mode transducer is crucially affected by the quality of its bonding layer. Two new constants, the thickness coefficient and the adhesion coefficient s, are introduced in order to numerically evaluate the quality of the bonding layer. The electrical input impedance curves of bonded transducers for various values of the new constants together with various values of electro-mechanical coupling coefficients are obtained and compared with data for experimental transducers. It has been found that these theoretical impedance curves can be used to diagnose the bond quality of the experimental transducers. 12 refs.

ID NO.- EI731153978 353978
PROPAGATION VELOCITIES AND AMPLITUDES OF THERMO-ACOUSTICAL WAVES IN THERMO-PLASTIC MATERIALS.
Tokuoka, Tatsuo
Kyoto Univ, Jap
DESCRIPTORS- (*MATERIALS, *Thermal Effects), THERMODYNAMICS,
CARD ALERT- 641
CODEN- TJASAM SOURCE- Trans Jap Soc Aeronaut Space Sci v 16 n 32 1973 p 102-112
There are, in general, four propagation velocities and they have the temperature rate discontinuity as well as the acceleration discontinuity. The principal waves are separated into two kinds. One is two transverse waves, which have same propagation velocity and are purely mechanical, and the other is two coupling waves with mechanical longitudinal and thermal components. The wave velocities and the ratios of thermal and mechanical amplitudes of the coupling waves are studied. 16 refs.

ID NO.- EI731051419 351419
DON'T STARVE AIR TOOLS.
Lamb, Ted
Parker Hannifin Corp, Minneapolis, Minn
DESCRIPTORS- (*TOOLS, JIGS AND FIXTURES, *Pneumatic), PNEUMATIC DRIVE,
CARD ALERT- 603, 632
CODEN- PLENAV SOURCE- Plant Eng (Barrington, Ill) v 27 n 16 Aug 9 1973 p 78-81
Recommended air hose diameters, based on length and air flow (cfm) are listed in chart form for impact wrenches, screw and nut drive tools, drills, hammers and abrasive tools. A troubleshooting checklist summarizes possible causes and solutions for leaks and disconnect problems.

ID NO.- EI731049614 349614
DIGITAL TRANSIENT SUPPRESSOR ELIMINATES LOGIC ERRORS.
Strangio, Christopher
Villanova Univ, Pa
DESCRIPTORS- *LOGIC CIRCUITS.
CARD ALERT- 721
CODEN- ELECAD SOURCE- Electronics v 46 n 16 Aug 2 1973 p 98

In digital systems, switching transients occur most often when there is a transition from logic 0 to logic 1 or from logic 1 to logic 0. These transients can introduce errors if their amplitude is large enough to exceed the logic 0 maximum voltage or the logic 1 minimum voltage. Errors are particularly likely to occur at mechanical-to-electrical couplings, as in switches and relays. The article presents a simple digital circuit which can prevent both positive-going and negative-going logic transients from causing output errors.

ID NO.- EI730945494 345494
ANALYSIS OF THE MARTENSITE BURST IN A DEFORMED AND THERMALLY STABILIZED AUSTENITE IN A POLYCRYSTALLINE Fe-Ni-C ALLOY.
Guimaraes, J. R. C.; Brito, R. M.
Instituto Militar de Engenharia, Rio de Janeiro, Brazil
DESCRIPTORS- (*IRON CARBON NICKEL ALLOYS, *Deformation), (IRON AND STEEL METALLOGRAPHY, Martensite).
CARD ALERT- 531, 535, 545
CODEN- SCRMBU SOURCE- Scr Metall v 7 n 6 Jun 1973 p 621-626

The experimental observations presented suggest that plastic deformation of austenite decreases the autocatalytic generation of preferred nucleation sites for martensite; the mechanical coupling of the plates shape-strain helps the transformation by adding to the reaction driving force; small amounts of plastic deformation enhance the mechanical coupling of the plates formed in a burst. 8 refs.

ID NO.- EI730944619 344619
WIRING DEVICES IMPROVED IN SAFETY FEATURES.
Landisi, Ronald J.
Westinghouse Electric Corp, Bridgeport, Conn
DESCRIPTORS- *ELECTRIC EQUIPMENT PROTECTION.
CARD ALERT- 704
CODEN- WNHEAB SOURCE- Westinghouse Eng v 33 n 3 May 1973 p 86-89

Wiring devices, as the term is used in this article, are devices used to control, connect, and disconnect electrical power at its point of use; examples are wall switches, receptacles, attachment plugs, and connectors. government legislation regarding the manufacture of safe products and their use in safe ways is reviewed. A few examples of wiring devices are discussed which illustrate the main areas in which design, construction, standardization, and material selection have been coordinated to produce devices that are inherently safe and give dependable service.

ID NO.- EI730943654 343654
DESIGN OF VALVE BODY AND GOVERNOR SYSTEMS.
Hewitt, D. C.; Leonard, R. I
Ford Motor Co
DESCRIPTORS- (*AUTOMOBILE TRANSMISSIONS, *Valves), VALVES AND VALVE GEAR, CONTROL EQUIPMENT, HYDRAULIC.
IDENTIFIERS- VALVE BODIES
CARD ALERT- 602, 632, 661
SOURCE- Des Pract: Passenger Car Autom Transm, SAE Transm Workshop Meet, 2nd Ed p 319-338. Publ by SAE, New York, (Adv in Eng, Vol 5) 1973

The function of an automatic transmission valve body and governor system is to regulate pressure and direct fluid from a pump or pumps to transmission components such as the torque converter or fluid coupling, band servos, clutch cylinders, cooler circuits, and lubrication systems. The scope of this paper includes the following: Discussion of the factors affecting the design of the hydraulic control systems. Function of basic types of hydraulic valves and the accompanying circuits. Description of typical designs of automatic transmission hydraulic systems. Synthesis of a hydraulic control system for a hypothetical transmission by combining valves and circuits to meet specific functional requirements. Calculations of valve areas by solution of simultaneous equations.

ID NO.- EI730943637 343637
DESIGN OF SINGLE-STAGE, THREE-ELEMENT TORQUE CONVERTER.
Jandasek, V. J.
Ford Motor Co
DESCRIPTORS- (*AUTOMOBILE TRANSMISSIONS, *Design), TORQUE CONVERTERS, HYDRAULIC.
IDENTIFIERS- HYDRODYNAMIC DRIVE
CARD ALERT- 602, 632, 661
SOURCE- Des Pract: Passenger Car Autom Transm, SAE Transm Workshop Meet, 2nd Ed p 201-226. Publ by SAE, New York, (Adv in Eng, Vol 5) 1973

This torque converter consists of three members, each with only one element or row of flow directing blades. It is a single stage unit that is two phase in operation with the first phase encompassing operation as a torque converter and the second involving a fluid coupling range. A rotating housing and torus with a disposition of impeller, turbine, and reactor. Axial thrust can be formidable in converters, but in the type of unit discussed here, it is not a serious problem. this is due, to some extent, to the fact that the majority of operation occurs at high-speed ratios where the thrust is reduced considerably. The impeller thrust is substantially equal and opposite in direction to the sum of the thrusts of the turbine and reactor.

ID NO.- EI730943636 343636
NEW TYPE OF THREE-MEMBER HYDRODYNAMIC UNIT.
Qualman, J. W.; Egbert, E. L.
GM
DESCRIPTORS- (*AUTOMOBILE TRANSMISSIONS, *Design).
IDENTIFIERS- HYDRODYNAMIC DRIVE
CARD ALERT- 602, 661
SOURCE- Des Pract: Passenger Car Autom Transm, SAE Transm Workshop Meet, 2nd Ed p 198-200. Publ by SAE, New York, (Adv in Eng, Vol 5) 1973

The three-member hydrodynamic unit described is somewhat of a hybrid, having some characteristics of both the fluid coupling and the torque converter. It affords supplementation of the gear ratio in a step-gear transmission with good extension of this torque-multiplying range. This gives greater overall ratio coverage with the same number of gear steps or the same overall ratio coverage with fewer gear steps. It compares very closely in efficiency with a two-member drive coupling when functioning as one. The third member (reactor) is simple, inexpensive, and does not require a one-way clutch. The impeller and turbine members are similar to coupling members and thus adaptable to the same relatively low-cost manufacturing and assembly methods.

ID NO.- EI730943635 343635
FLUID COUPLINGS.
Qualman, J. W.; Egbert, E. L.
GM
DESCRIPTORS- (*AUTOMOBILE TRANSMISSIONS, *Design).
IDENTIFIERS- FLUID COUPLINGS
CARD ALERT- 602, 661
SOURCE- Des Pract: Passenger Car Autom Transm, SAE Transm Workshop Meet, 2nd Ed p 183-197. Publ by SAE, New York, (Adv in Eng, Vol 5) 1973

The information presented here describes the basic types of units now in use and points out the considerations involved in their design. Every effort has been made to be as specific as possible, rathern than to deal in general terms. In addition, we have tried to show the effects of varying the critical factors involved. this was done to serve as a guide where departure from the basic design may be necessary to accomplish the desired objectives, which vary for each installation.

ID NO.- EI730839232 339232
SELECTION OF CABLES FOR DIRECT-ON-LINE MOTORS WITH PARTICULAR REFERENCE TO STARTING TORQUE AND CABLE LENGTH.
Golding, S.
DESCRIPTORS- (*ELECTRIC CABLES, *Rating), ELECTRIC MOTORS.
CARD ALERT- 705, 706
CODEN- CEENA9 SOURCE- Certif Eng v 46 n 2 Feb 1973 10 p between p 27 and 36

The paper deals with the selection of cables for motors started direct-on-line. The required starting torque and the volt-drop in the cable are taken into consideration. An equation is derived to consider these factors and tables are provided to assist in the selection of cable sizes. The cost of fluid couplings may often be justified to a great extent by the saving in cable, particularly on long runs. The use by the mining industry of 525-V instead of 380-V as used in industry can result in considerable savings in cables.

ID NO.- EI730838333 338333
EXPERIMENTAL URBAN VEHICLE.
Seal, Michael R.
Western Wash State Coll, Bellingham
DESCRIPTORS- (*AUTOMOBILES, *Design), (AIR POLLUTION, Control), (AUTOMOBILE ENGINES, Exhaust Gases),
IDENTIFIERS- EXPERIMENTAL URBAN VEHICLES
CARD ALERT- 451, 661, 662
CODEN- SEPPA8 SOURCE- SAE Prepr n 730509 for Meet May 14-18 1973 13 p
An experimental car with mid-engine rear drive chassis and pyramid link suspension is the subject of this paper. Extreme Ackerman steering allows a 9 ft turning radius. The chassis quick-disconnects into three major sections to facilitate servicing. A bias beam brake linkage allows easy adjustment of front-rear brake bias. The low emission engine runs on propane and is equipped with a thermal reactor and an EGR system. The body chassis center unit is made from epoxy fiberglass surface aluminum honeycomb. Passive restraint seat belts are attached to semigull wing doors. Five mph bumpers are fitted to each end. The front uses extrusion belts: the rear uses beverage cans in compression.

ID NO.- EI730628703 328703
INSTRUMENTATION TECHNIQUES IN HIGH VOLTAGE SUBSTATIONS $EM DASH$ 1. MEASURING, TRIGGERING AND INTERFERENCE REDUCTION.
Rogers, Eldon J.
Bonneville Power Administration, Portland, Oreg
DESCRIPTORS- (*ELECTRIC SUBSTATIONS, *Control), ELECTROMAGNETIC COMPATIBILITY,
CARD ALERT- 706
CODEN- IEPSA9 SOURCE- IEEE Trans Power Appar Syst v PAS-92 n 1 Jan-Feb 1973 p 127-131
Measurement of transient potentials in substation yards on control circuits, CTs, CPTs, 115 vac receptacles, howlers, yard telephones, heaters, flood lights and cable lead sheaths during disconnect switch arcing require more stringent instrumentation techniques than comparable measurements made in the control house. Methods and equipment have been devised to trigger oscilloscopes independent of recorded transient and reduce measuring circuit interference voltages. 10 refs.

ID NO.- EI730420807 320807
PROCEEDINGS OF THE SECOND SYMPOSIUM ON FUNDAMENTALS OF TRANSPORT PHENOMENA IN POROUS MEDIA.
Heller, J. P.; Greenkorn, R. A.; Dullien, F. A. L.; Farrel, D. A.; Larson, W. E.; Bomberg, M.; Dixon, R. M.; Ibad-Zade, Yu. A.; Shteinman, B. S.; Rogowski, A. S.; Ibrahim, M. A.; Katz, D. L.; Raats, P. A. C.; Bachmat, Y.; Bear, J.
DESCRIPTORS- (*SOILS, *Moisture), FLOW OF WATER, FLOW OF FLUIDS, (GRANULAR MATERIALS, Permeability), POROUS MATERIALS,
IDENTIFIERS- INFILTRATION, SATURATED FLOW, NONSATURATED FLOW
CARD ALERT- 483, 631
SOURCE- Symp on Fundam of Transp Phenom in Porous Media, 2nd, Guelph, 1972, Proc. 2 v. Held Univ of Guelph, Ont, Aug 7-11, 1972, 797 p
Proceedings of the symposium includes 51 papers grouped under the headings of matrix properties: fluid flow: coupling: physical-chemical-microbial: and dispersion. Some specific topics discussed are: computer analysis of the pore structure of isotropic porous media: evaluation of capillary properties of caprocks: analytical theory of water movement in soils: flow of water in swelling soil: transient gas flow: flow laws for pseudoplastic injection fluids: filter processes in river beds: and effect of soil salinity on the evaporation rate. Following is a listing of papers presented. Observations of Mixing and Diffusion in Porous Media. By J. P. Heller. Matrix Properties of Porous Materials. By R. A. Greenkorn. Pore Structure and Flow Properties of Porous Media. By F. A. L. Dullien. Computer Analysis of the Pore Structure of Isotropic Porous Media. By D. A. Farrel and W. E. Larson. Similitude Requirements for Moisture Flow Through Porous Materials. By M. Bomberg. Controlling Water Infiltration in Bimodal Porous Soils: Air-Earth Interface Concept. By R. M. Dixon. Field Study of Sand Motion Through a Porous Medium by Means of Luminophors. By Yu. A. Ibad-Zade and B. S. Shteinman. Two and Three Point Models of the Soil Moisture Characteristic and Hydraulic Conductivity for Field Use. By A. S. Rogowski. Evaluation of Capillary Properties of Caprocks. By M. A. Ibrahim and D. L. Katz. Jump Conditions in the Hydrodynamics of Porous Media. By P. A. C. Raats. Mathematical Formulation of Transport Phenonema in Porous Media. By Y. Bachmat and J. Bear.

ID NO.- EI730104858 304858
CRITICAL MAGNETIC FLUID OF STRONG COUPLING SUPERCONDUCTORS.
Vashishta, P.; Carbotte, J. P.
Argonne National Lab. Ill
DESCRIPTORS- (*SUPERCONDUCTING MATERIALS, *Magnetic Properties), MAGNETIC PROPERTIES,
CARD ALERT- 708
CODEN- SSCOA4 SOURCE- Solid State Commun v 11 n 4 Aug 15 1972 p 539-542
New results for the temperature variation of the thermodynamic critical magnetic field of four strong coupling superconductors are presented. Amorphous Ga for which the calculated temperature variation of the reduced gap shows largest deviations from the BCS predictions exhibits the smallest deviations in D(t) among the four materials. The strongest deviations are found to occur in the alloy Pb//0//. //9 Bi//0//. //1, where they are nearly one and a half times as large as the ones calculated in Pb. 13 refs.

ID NO.- EI730102460 302460
GEOMETRIC OPTICS OF THERMAL BLOOMING IN GASES $EM DASH$ 1.
Avizonis, P. V.; Hogge, C. B.; Butts, R. R.; Kenemuth, J. R.
Kirtland Air Force Base, Albuquerque, NMex
DESCRIPTORS- •LASER BEAMS, (LIGHT, Propagation).
IDENTIFIERS- THERMAL BLOOMING, THERMOOPTIC EFFECTS
CARD ALERT- 741, 744
CODEN- AFOPAI SOURCE- Appl Opt v 11 n 3 Mar 1972 p 554-564
Thermal blooming is considered for cases with and without wind transverse to the beam propagation from the point of view of fluid dynamics of a compressible gaseous system and the coupling of this with geometric optics using eikonal formalism. A general time dependent model for the interaction of a laser beam with a compressible absorbing medium in the presence of wind is developed, and certain time dependent analytical solutions are obtained. These solutions reduce to the plain thermal blooming case with no wind and for long time periods to steady state wind case that has been previously reported by others to various degrees of correctness. 20 refs.

ID NO.- EI721319615 297612
WHY ANOTHER LIGHT TWIN JET: THE SN 601 - CORVETTE.
Briot, Robert
Societe Nationale Industrielle Aerospatiale, Fr
DESCRIPTORS- (•AIRCRAFT, PERSONAL, •Design).
IDENTIFIERS- LIGHT TWIN JET AIRCRAFT
CARD ALERT- 652
SOURCE- SAE Pap n 720335 for Meet Mar 15-17 1972, 8 p
In the SN-601 Corvette, Aerospatiale has produced a light twin having large cabin volume, cruise speed above 400 kt with only limited thrust, and a short-field capability using simple high-lift devices. Spoilers are of the retractable type and are interconnected with the ailerons so as to automatically disconnect should the spoilers jam in any position.

ID NO.- EI721211067 289066
1100-KV DISCONNECT SWITCH DESIGN, TESTS, AND APPLICATION AT THE WALTZ MILL 1100-KV STATION.
Ahrano, C. J.; McKinnon, J. F.
Southern States, Inc, Hampton, Ga
DESCRIPTORS- (•ELECTRIC SWITCHGEAR, •Testing), ELECTRIC SUBSTATIONS.
CARD ALERT- 704, 706
CODEN- IEPSA9 SOURCE- IEEE Trans Power Appar Syst v PAS-91 n 4 Jul-Aug 1972 p 1506-1513
The Waltz Mill Project, performing accelerated life testing of prototype samples of 115-kV to 750-kV, is part of the Electric Research Council's underground transmission system research program. Waltz Mill also serves as a prototype of 1100-kV overhead type substations. This paper describes the design and testing of 1100-kV disconnect switches for application at Waltz Mill and on future systems. 11 refs.

ID NO.- EI721000350 278350
MOTORIZED DRIVE FOR THE DOUBLE-TILTING SPECIMEN HOLDER OF AN ELECTRON MICROSCOPE.
Kritzinger, S.; Marais, D. J.; Monaci, T.
Univ of Stellenbosch, S Afr
DESCRIPTORS- •MICROSCOPES, ELECTRON, ELECTRIC MOTORS.
IDENTIFIERS- MOTORIZED DRIVE, SPECIMEN HOLDER
CARD ALERT- 422, 705, 715
CODEN- RSINAK SOURCE- Rev Sci Instrum v 43 n 6 Jun 1972 p 866-871
A detailed description is given of a very compact motorized drive for the double-tilting specimen stage of an electron microscope. Tilting is effected by foot controls at a speed which is continuously variable between wide limits. Manual tilting is possible by simply turning a lever to disconnect the motorized drive. No alterations to the microscope column are necessary to receive the motorized unit.

ID NO.- EI72X054649 254649
Minimal k- arc connected graphs
FULKERSON DR
Rand Corp, Santa Monica, Calif
DESCRIPTORS- •ELECTRIC COMMUNICATION, MATHEMATICS.
IDENTIFIERS- COMMUNICATION NETWORKS, GRAPH THEORY
CARD ALERT- 716, 718
SOURCE- ##sant MONICA, Calif(, LS.SHAPLEY
Networks v 1 n 1 1971 p 91- 8: A raph is k- arc- connected if it is necessary to remove at least k arcs in order to disconnect the graph. This paper solves the problem of determining the least number of arcs required in a k- arc-connected graph on n nodes by describing constructions that produce such graphs having kn/2 arcs (for kn even) or (kn plus 1)/2 arcs (for kn odd). These results have application to the practical problem of synthesizing minimum cost. '%'k-reliable'%' communication networks.

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ID NO.- EI72X053054 253054
Effect of mechanical and thermal processing on the magnetic properties of alfer. (Wplyw obrobki mechanicznej i termicznej na wlasciwosci magnetyczne alferu)
KACZKOWSKI Z: MILEWSKA E
DESCRIPTORS- (•IRON ALUMINUM ALLOYS, •Magnetic Properties). MAGNETIC MATERIALS.
CARD ALERT- 541, 545, 701
SOURCE- Elektronika v 12 n 10 1971 p 411-13
The hot and cold- rolled alloy FeAl was investigated. The annealing temperatures in the range from 750 to 1300 C were studied as to their influence on permeability and magnet-mechanical coupling. The experimental results are given. 12 refs. In Polish.

ID NO.- EI72X052065 252065
115- kv substation structure installed in two days
SMITH CF
DESCRIPTORS- •ELECTRIC SUBSTATIONS.
CARD ALERT- 402, 706
CODEN- TRDIA SOURCE- Transm Distrib v 24 n 1 Jan 1972 p 28-30
Power- installed screw anchors iistead of concrete foundations are shown to result in fast, economical erection of the substation structure. The structures described were to support two line- break switches, an air- break disconnect switch for the transformer, a 7500 kva transformer (1. 15 kv/34. 5 kv), and three 34. 5 kv reclosers.

ID NO.- EI72X048624 248624
Properties of overload- type fluid couplings
YAREMENKO OV: KONONENKO II
DESCRIPTORS- (•COUPLINGS, •Hydraulic).
CARD ALERT- 602
CODEN- VMASA SOURCE- Vestn Mashinostr n 5 May 1971 p 17-21. See also English translation in Russ Eng J n 5 May 1971 p 17-20
Discussion into overload- type fluid couplings by their dimensionless characteristics. The advantages of certain fluid couplings used in nonreversible drives so as, for example, to protect an asynchronous squirrel- cage motor from overloads are considered.

ID NO.- EI72X044262 244262
Analysis of the electromechanical coupling during elastic oscillations in the motor drive
KLYUCHEV VI
Moscow Power Engineering Inst
DESCRIPTORS- •ELECTRIC DRIVE, VIBRATIONS, ELECTRIC MOTORS.
CARD ALERT- 931
CODEN- ELEKA SOURCE- Elektrichestvo n 9 Sept 1971 p 47-51
The coupling in a system with a drive containing elastic mechanical couplings is analyzed for its amplitude- frequency characteristics. For this purpose, an electromechanical coupling is proposed, representing the relation of the motor armature current oscillation amplitudes to the amplitude of the elastic moment fluctuation when on the motor wall mechanical oscillations arise having the frequency equal to the frequency of undamped free oscillations of the mechanical part of the drive. The areas of weak, considerable, and rigid electromechanical oscillations are delineated. The possibility is shown to vary the oscillations' elasticity by feedback. In Russian.

ID NO.- EI72X043781 243781
Magneto- mechanical coupling factor in magnetostrictive ferrites. (Factorul de cuplej magneto- mecanic la ferite magnetostrictive)
MANDACHE S
Institutul de fizica, Bucharest, Roumania
DESCRIPTORS- •MAGNETIC DEVICES, TRANSDUCERS, (MAGNETIC MATERIALS, Ferrites).
CARD ALERT- 701, 704
CODEN- ELTHA SOURCE- Electrotehnica v 19 n 11 Nov 1971 p 412-15
The problems are discussed concerning magneto- mechanical coupling in magnetostrictive ferrites, widely applied in ultrasonics and particularly in magnetostrictive transducers. 14 refs. In Roumanian.

ID NO.- EI72X041984 241984
Demand controllers disconnect some loads during peak periods
MURPHY EE: DORSETT JG
DESCRIPTORS- (•APARTMENT HOUSES, •Power Supply), WATT-HOUR METERS.
IDENTIFIERS- DEMAND METERS
CARD ALERT- 402, 706, 942
CODEN- TRDIA SOURCE- Transm Distrib v 23 n 7 July 1971 p 48-53
The load control of water heating, space heating and air conditioning in a hypothetical all- electric 25- story apartment complex is discussed. A significant reduction in the average demand yields a substantial decrease in an annual electric bill. However, this is only feasible if the demand control system assures that the total heating and cooling energy requirements are met along with the demand control.

ID NO.- EI72X036210 236210
Advances in microwaves, v 6
YOUNG ED L
DESCRIPTORS- *WAVEGUIDES, ELECTROMAGNETIC WAVES, (COMPUTERS, Simulation),
IDENTIFIERS- MICROWAVE TRANSMISSION
CARD ALERT- 711, 714, 723
SOURCE- Academic Press, Inc, New York, 1971, 269 p
The volume deals in three chapters with advances in microwave technology. First chapter discusses coaxial transmission problems, such as transmission line, dielectric support, precision coaxial connectors and mechanical coupling mecanism. Second chapter is related to electron dynamics and energy conversion in O- type linear- beam devices. Mathematical analysis as well as computer solutions of electromagnetic equations are presented. Third chapter deals with principles and properties of junction circulators. Numerous references are cited at the end of each chapter.

ID NO.- EI72X028393 228393
Identification of structural processes in deformation of oriented polyethylene
KELLER A; POPE DP
Univ of Bristol, England
DESCRIPTORS- (*POLYMERS, *Polyethylene), (PLASTICS, Polyethylene),
CARD ALERT- 815
CODEN- JMTSA SOURCE- J Mater Sci v 6 n 6 June 1971 p 453-78
The investigation is concerned with the relation between changes in the submicroscopic structure, as revealed by low angle x- ray scattering in combination with the usual wide angle x- ray diffraction, and changes in the macroscopic sample dimensions during the deformation of oriented low density polyethylene. The samples examined are mainly drawn and rolled sheets possessing a double crystal texture, with a limited additional study on a drawn sample with fiber symmetry and on recently discovered single texture specimens. The results are evaluated and discussed in terms of existing conceptions of an orientedpolymer and are related to earlier findings on this subject. It is pointed out in particular that the samples in question represent a very simple mechanical system- a series coupling of the individual structural processes involved suffices to describe the response of the sample to externally imposed stress. 30 refs.

ID NO.- EI72X023108 223108
Disconnect techniques for flexible circuitry
STEARNS TH
Teledyne Electro-Mechanisms, Nashua, NH
DESCRIPTORS- (*RADIO EQUIPMENT, *Packaging),
CARD ALERT- 714
CODEN- ELPPA SOURCE- Electron Packag Prod v 11 n 2 Feb 1971 p 69-78
Flexible etched circuitry is a packaging engineer's tool. It came into being as a direct replacement for wire harnesses and has gradually broadened in usage to include all types of packages, military, commercial, large, small, complex, simple. This article points up current thinking in design and application from the packaging point of view.

ID NO.- EI72X023000 223000
Automated controls for plastics processing
DESCRIPTORS- (*PLASTICS MACHINERY, *Control), (AUTOMATIC CONTROL, Equipment),
CARD ALERT- 731, 732, 816
CODEN- PDPRA SOURCE- Plast Des PRocess v 11 n 1 Jan 1971 p 12-13
Brief report on new developed and introduced on the market all- process control systems adaptable to any of the major processing methods- injection, compression, transfer, blow molding , thermoforming, foaming, and rotational molding. The modular systems include temperature control, process timers, machine sequence control, monitor alarm and display, machine position sensor, process regulators, line disconnect and a c power circuits, operator station, and electric drives.

ID NO.- EI72X022148 222148
Flow- induced vibration in heat exchangers. Presented at Winter Annual meeting Dec 1 1970, New York, NY
DESCRIPTORS- (*HEAT EXCHANGERS, *Vibrations), (HEAT EXCHANGERS, Tubes), NUCLEAR REACTORS, (HEAT EXCHANGERS, Design)
.
CARD ALERT- 616, 621, 931
SOURCE- ASME, New York, NY, 1970, 88 p
Volume 12 contains articles by various authors on vibration of tubes in exchangers designed primarily for nuclear service. Current information on the state of the art and specific needs for future development. Papers show need for designer to consider other sources of vibrations, such as those transmitted by the adjacent structure and to consider flow passage instability in parallel flow systems, acoustic resonance, pressure pulsations in two- phase flow systems, and fluid coupling of mechanical vibrations of other components within the fluid system. Individual papers are indexed separately.

ID NO.- EI72X012717 212717
Spark gap monitor
BROWN D
Univ of California, Los Alamos, NMex
DESCRIPTORS- *ELECTRIC SPARK GAPS, (RADIATION, Measurement), (RADIO CIRCUITS, Delay).
IDENTIFIERS- MONITORS
CARD ALERT- 704, 713, 944
CODEN- RSINA SOURCE- Rev Sci Instrum v 42 n 9 Sept 1971 p 1287-91

A method for determining the delay of many electrical signals with respect to a common trigger (e. g. , in capacitor banks) is described. Using the principle of time- to- pulse- height conversion, a low leakage polystyrene capacitor is charged to a voltage proportional to the delay. A reed relay is used to disconnect the capacitor from the charging circuit, which permits the charge to be maintained on the capacitor for many seconds. Another reed relay is employed to connect each capacitor to an ADC when it is desired to digitize the charge on the capacitor.

ID NO.- EI72X012275 212275
Wake induced flutter of circular cylinders. Mechanical aspects
SIMPSON A
Univ of Bristol, England
DESCRIPTORS- (*FLOW OF FLUIDS, *Cylinders), (AERODYNAMICS, Flutter).
CARD ALERT- 631, 651
CODEN- AEQUA SOURCE- Aeron Quart v 22 pt 2 May 1971 p 101-18

In this paper, the class of cases wherein the mechanical support system for the leeward cylinder exhibits static coupling is studied using '%'undamped flutter theory'%'. It is demonstrated that the appearance of static coupling terms can lead to quite dramatic changes in the flutter characteristics, and that considerable care must be exercised in the design and operation of wind- tunnel dynamic models if meaningful results are to be obtained. An appendix deals with the general problem of mechanical coupling, using the normal coordinates approach, and aspects of the problem which bear on thesubconductor oscillation phenomen experienced on '%'bundled'%overhead power transmission lines are highlighted.

ID NO.- EI72X004902 204902
Application of load break switches for switching high-voltage AC shunt capacitor banks
SOLORZANO EF; RUSH PL
Dept of Water and Power, Los Angeles, Calif
DESCRIPTORS- (*ELECTRIC CAPACITORS, *Switching), (ELECTRIC TRANSMISSION, Direct Current), ELECTRIC SWITCHGEAR.
IDENTIFIERS- HV-DC CONVERTER STATIONS, LOAD BANK SWITCHES, INTERRUPTERS, Sulfur Hexafluoride
CARD ALERT- 704, 706
CODEN- IEPSA SOURCE- IEEE Trans Power App Syst v PAS90 n 4 July-Aug 1971 p 1504-10

A study to determine the most economical means of switching 230 kv shunt capacitor banks of 84 Mvar each is reported. Complex switching requirements and an expected low- ohmic resistor value as well as the cost of 230 kv power circuit breaker, prompted the study. A load break switch, consisting of a combined SF//6 interrupter, pre- insertion resistors and disconnect switch, are shown to meet the requirements for switching 230 kv shunt capacitor banks. The test procedure and results obtained on such a load break switch at a h v d c converter station are described. Paper 70- TP- 595- PWR.

ID NO.- EI72X003582 203582
Effects of mechanical stretching and quadratic coupling on critical behavior
COPLAN LA; DRESDEN M
State Univ of New York, Stony Brook
DESCRIPTORS- *MAGNETISM, MAGNETIC MATERIALS.
IDENTIFIERS- PHYSICS, PHASE TRANSITIONS
CARD ALERT- 701, 931
CODEN- PRLTA SOURCE- Phys Rev Lett v 25 n 12 Sept 21 1970 p 785-8

Assuming the existence of certain limits an exact solution is given of a two- dimensional elastic Ising model with quadratic coupling. The main results are these- if the lattice is slightly stretched, thermodynamic instability occurs for temperatures in a neighborhood of the critical point. Outside this neighborhood, kT, !, and Cp diverge. The nearest-neighbor spin- spin correlation function is nonzero for any pressure when T becomes infinite. Antiferromagnetic as well as ferromagnetic behavior can occur for weak coupling at any pressure. For strong coupling at 0 pressure the model can have a Curie and Neel point or no critical point.

ID NO.- EI71X183373 183373
Degrees of freedom of cochlear patterns
RINK RE
Univ of Alberta, Edmonton
DESCRIPTORS- *AUDITION,
IDENTIFIERS- COCHLEA, DEGREES OR FREEDOM
CARD ALERT- 751
CODEN- JASMA SOURCE- J Acoust Soc Amer v 48 n 6 pt 2 Dec 1970 p 1379-82

Although auditory patterns, from the cochlea inwards, are distributed in space and time, they do not have an infinite number of degrees of freedom. Because of mechanical coupling, motions at neighboring points along the chochlea are not statistically independent. Results are given for the number of equivalent degrees of freedom along the spatial axis of auditory patterns when displacement of the basilar membrane is the pattern variable and when envelope of displacements is the pattern variable. These numbers are compared with other estimates of the dimensionality of auditory pattern space. 5 refs.

ID NO.- EI71X181766 181766
Thrust restraint for cast iron piping systems
CARLSEN RJ
DESCRIPTORS- *PIPE, CAST IRON, WATER PIPE LINES,
CARD ALERT- 446, 545, 619
CODEN- PUWOA SOURCE- Pub Works v 102 n 3 Mar 1971 p 64-7

Various methods of restraining thrust forces for cast iron piping systems are summarized. A review of thrust force calculation and a general discussion of restraining techniques is presented. Tie rods used in conjunction with mechanical coupling and for tieing to an abutment are shown together with thrust block details for various fittings.

C-2

ID NO.- EI71X172671 172671
Influence of dislocations in CdS crystal on its electro mechanical coupling factors
CHUBACHI N; IINUMA K; KIKUCHI Y
Tohoku Univ, Sendai, Japan
DESCRIPTORS- (*SEMICONDUCTORS, *Cadmium Compounds),
IDENTIFIERS- DISLOCATIONS, CADMIUM SULFIDE, ELECTROMECHANICAL COUPLING FACTORS
CARD ALERT- 712
CODEN- JAPIA SOURCE- J Appl Phys v 42 n 3 Mar 1971 p 962-7

The electromechanical coupling factors are measured in the frequency range from 100 kHz to 260 MHz for CdS single crystals with various dislocation densities. These measurements show that each of the electromechanical coupling factors begins to decrease in a steep slope as the density of dislocation which terminates at c surface of the crystal exceeds an amount around 10//6 cm- //2. However, these coupling factors come back toward the normal values when the density of dislocation is decreased by means of the annealing of the crystals in a sulfur vapor. No appreciable change of the elastic constants and the dielectriconstants is observed. Therefore, the observed variation of the electromechanical coupling factors is attributable to the dependence of the corresponding piezoelectric constants on the dislocation density.

ID NO.- EI71X059414 159414
Nondestructive testing of welded tubing in C- 5 Aircraft
ERDMAN DC; JENKINS TC
Consultants Inc, Pasadena, Calif
DESCRIPTORS- (*TUBES, *Welding), (MATERIALS TESTING, Nondestructive),
CARD ALERT- 000
SOURCE- Proc 1968 Symp on NDT of Welds & Mater Joining, Mar 11-13 1968, Los Angeles, Calif, p 715-32

The use of tubing welded in place is increasing tremendously, particularly as airplanes get larger. Reliability is also enhanced by the reduction in the number of mechanical couplings. This paper describes an ultrasonic method of flow detection in the confined areas. The introduction of this method and the design and fabrication of a unit has proven that a satisfactory ultrasonic inspection of tube welds can be accomplished within the areas required for the fabrication of such welds.

ID NO.- EI71X053107 153107
NQR pulse relaxometer for the 2 to 70 MHz range
PAVLOV BN; KLEBANOV AN; BONDARENKO IS
DESCRIPTORS- (*SPECTROMETERS, MAGNETIC RESONANCE, *Accessories), (RADIO CIRCUITS, Pulse),
IDENTIFIERS- PULSE RELAXOMETERS
CARD ALERT- 713, 942, 944
CODEN- INETA SOURCE- Instrum Exp Tech n 1 Jan-Feb 1970 p 169-71

An NQR spectrometer is described that provides observation of the induction and spin- echo signals, as well as measurement of relaxation times, for the range 2 to 70 MHz. Automatic search for weak NQR signals is made possible by mechanical coupling, automatic heterodyne tuning, signal averaging, and pen recording. 14 refs.

ID NO.- EI71X039823 139823
Iran's Saam. First of Vosper's Mk 5 destroyer/frigates
DESCRIPTORS- (*WARSHIPS. *Iran). (GAS TURBINES. Marine). (SHIPS PROPULSION. Gas Turbine).
CARD ALERT- 612. 671. 672
CODEN- MENLA SOURCE- Mar Eng/Log v 75 n 12 Nov 1970 p 62-3
The Mk 5 destroyer/frigate Saam's main machinery is comprised of two Rolls- Royce TM2A marine Ol,mpus gas turbines. nominally rated at 24.000 bhp each driving into separate David Brown double- reduction gear boxes. and two Paxman Ventura 16 YJCM diesels delving into the same gear boxes in a CODOG arrangement. The gas turbines are not enclosed in the standard modules which have been developed since this ship design begun. but have acoustic booths integral with the structure to absorb the noise radiated from the gas generators and to provide the necessary housing to carry a supply of cooling air to the external surfaces of the gas generator. The air intakes pass6 1/2 tons of air/min when at full power. The power turbines are connected to the gear boxes through flexible couplings and torque tubes at 5660 rpm maximum pwer. The gear boxes have a reduction of 14 to 1 on the gas turbine drive and 8 to 1 on the diesel drive. the gas turbine drive being double- reduction dual- tandem. locked- train with single- helical. hardened and ground gears. Synchro- self- shifting clutches (SSS) are fitted on both input shafts and interlocked to prevent simultaneous driving by both power units. Fluid couplings are fitted between the diesel engines and the main gear boxes to enable the relatively small diesel engines to overcome the large gear- box and propeller shafting inertias without stalling.

ID NO.- EI71X032554 132554
All- electrostatic finishing at Ford's Kansas City plant
HOWARTH DC
DESCRIPTORS- (*AUTOMOBILE MANUFACTURE. *Finishing). (PAINT SPRAYING. Electrostatic).
CARD ALERT- 662. 701. 813
CODEN- IFIIA SOURCE- Ind Finish (Wheaton. Ill) v 46 n 10 Oct 1970 p 44-6
Mavericks are finished in one of four exotic or eleven standard exterior colors. The plant also produces commercial trucks at a rate up to 22/hr. finished in one of the 16 standard colors. The use of quick- disconnect fittings with the electrostatic guns permits color charges in as short a time as 5 sec. and savings of %more than 20% were obtained where electrostatic replaced conventional spray guns. The operations performed on two separate lines for finishing passenger cars are described.

ID NO.- EI71X027411 127411
Loudspeaker transmit/receive switch
TONG DA
DESCRIPTORS- (*RADIO CIRCUITS. *Switching).
CARD ALERT- 713
CODEN- WIWOA SOURCE- Wireless World v 76 n 1420 Oct 1970 p 476
In low- power radio transceivers it is customary to use the receiver output stage as the modulator when transmitting. a switch being used to disconnect the loudspeaker. A circuit which allows this switching to be accomplished remotely without the use of a mechanical relay is presented.

ID NO.- EI71X023022 123022
Contribution to the design of multi- element underwater acoustic arrays
SHAH CV
I.C.L.. Wenlock Way. West Gorton. Manchester. England
DESCRIPTORS- (*TRANSDUCERS. *Design). (PLATES. Vibrations). SOUND GENERATORS. (SOUND MEASUREMENT. Underwater).
CARD ALERT- 408. 751. 752. 931
CODEN- JSVIA SOURCE- J Sound Vib v 12 n 1 May 1970 p 125-30
In an array of crystals. the mechanical coupling between the crystals can be very troublesome. and especially in the types where the crystals are cemented upon the same metal plate or bar. The use of slots as a decoupling device in transducers having a common radiating head is investigated. It is found that there is a minimum coupling for grooves of shallow depth. A method for designing a multi- element acoustic array is proposed.

ID NO.- EI71X020009 120009
Insertion- loss repeatability versus life of some coaxial connectors
BERGFRIED D: FISCHER H
Weinschel Engineering Co Inc. Gaithersburg. Md
DESCRIPTORS- (*RADIO EQUIPMENT. *Connectors).
CARD ALERT- 714. 716
CODEN- IEIMA SOURCE- IEEE Trans Instrum Meas v IM-19 n 4 Nov 1970 p 349-53
One of the important characteristics of coaxial connectors in measurement applications is their insertion- loss repeatability. Measurements up to 18 GHz have been made of the performance of various precision and general- purpose connectors over many connect- disconnect cycles.

ID NO.- EI71X014720 114720
Transients induced in control cables located in EHV substation
SUTTON HJ
DESCRIPTORS- (*ELECTRIC SUBSTATIONS, *Control), ELECTRIC CONTROL, ELECTRIC CABLES, ELECTRIC SWITCHGEAR.
CARD ALERT- 704, 705, 706, 732
CODEN- IEPSA SOURCE- IEEE Trans Power App Syst v PAS-89 n 6 July-Aug 1970 p 1069-81

Tests are reported to evaluate the effectiveness of shielding control cables that are laid in concrete trenches located in an ehv environment. Particular attention is given to the effectiveness of shielding against HF transients generated by the opening and closing of 500 kv disconnect switches. Transients or spurious signals caused by induction from 60 Hz fault currents, or by the energization or de- energization of d- c contactor coils, or relay coils has fairly well been documented. Because of this, the main attention is given to the subject of high frequency transientsenerated by multiple restrikes in an arc or in corona. The conclusions pertain particularly to control cables laid in concrete trenches. To protect the shield and obtain further protection against transients, a heavy current carrying conductor properly grounded should be run along the same path as the shielded control cable. 14 refs. Paper 69 TP 665 - PWR.

ID NO.- EI71X010316 110316
Electric engine control system
DESCRIPTORS- (*SHIPS, *Control), SHIP PROPULSION, NAVAL VESSELS, (SHIPS, Electric Equipment), SERVOMECHANISMS.
CARD ALERT- 671, 672, 704, 732
CODEN- TIMEA SOURCE- Trans Inst Marine Eng v 82 n 4 Apr 1970 (Mar Eng J) p 8-10

The Vosper Electric system for coordination of controls in CODOG and COGOG sets has the following functions- cruise and b0ost engine throttle, boost engine SSS clutch engagement and disenagagement, propeller pitch control providing continuous matching to power demanded from engines with astern pitch facility, and actuation of fluid coupling scoop. The system does this by the positioning of a single lever for each shaft, duplicated in the machinery control room and on the bridge, and an associated rotary '%'engine select'%' switch. The system %is based on the use of synchros to transmit informat%ions to control position with associated servomotors actuating the various machinery controls to bring them into conformity with the position of the control lever. This means that the connections between bridge, machinery control room and engine rooms are purely electrical. The system is completed by the comprehensive relay logic and interlocks which prevent damage to the power plant through errors of control handling, and monitor the system's operation. Some details are given for major features of the system and typical applications.

ID NO.- EI71X009471 109471
Attenuation of dispersive Rayleigh waves on quartz
CAMBON G; ROUZEYRE M
CNRS, Faculte des Sciences, Montpellier, France
DESCRIPTORS- (*ULTRASONICS, *Measurements).
CARD ALERT- 753
CODEN- ELLEA SOURCE- Electron Lett v 6 n 17 Aug 20 1970 p 539-41

The attenuation properties of Rayleigh waves propagating in the x direction of y cut quartz have been measured with various metal films in the 30 to 157 MHz frequency range. The strong increase in the attenuation with film thickness is explained in terms of mechanical coupling and energy losses in the amorphous- metal films.

ID NO.- EI71X005930 105930
FORMAT, FORTRAN matrix abstraction technique
PICKARD J
DESCRIPTORS- (*COMPUTERS, *Programming), (STRUCTURAL DESIGN, Computer Applications).
IDENTIFIERS- MATRIX ALGEBRA, FORTRAN
CARD ALERT- 000
SOURCE- Air Force Flight Dynamics Lab, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, Tech Rep AFFDL-TR-66-207 v 5 Dec 1968, 688 p

The system provides for generation, manipulating, printing, and plotting of large order (i. e. , 2000) matrices commonly used in state- of- the- art structural analyses. Phse I of the system automatically generates matrices required in the thermomechanical analysis of structures by the Force or Displacement Methods including those necessary in joining, symmetric/antisymmetric reaction disconnect, vibration, and stability analyses. Modules for converting continuous- to- discrete loads, and analytic- to- discrete geometry and for maintenance of a master case data file are also provided to minimize input data requirements. Phase II provides an abstraction capability to effect basic matrix algebra via the standard matrix operations (e. g. , add, multiply, etc), several pseudo- matrix operations (e. g. , adjoin, diagonalize, etc), and several control operations (e. g. , save and print matrices, etc). The sequence of operations is user designated. Phase III provides for self- explanatory report form printing of matrix data resulting from Force or Displacement Method analyses, and a nominal graphical display capability for matrix and geometry data. 24 refs.

ID NO.- EI71X005904 105904
FORMAT. FORTRAN matrix abstraction techniques
COGAN JR JP: MORRIS RC: SERPANOS JE: WELLS JR: YOON PS
DESCRIPTORS- (•COMPUTERS. •Programming). (STRUCTURAL DESIGN. Computer Applications).
IDENTIFIERS- MATRIX ALGEBRA. FORTRAN. DIGITAL COMPUTERS
CARD ALERT- 000
SOURCE- Air Force Flight Dynamics Lab. Air Force Systems Command. Wright-Patterson Air Force Base. Ohio. Tech Report AFFDL-TR-66-207 v 6 Dec 1968. 735 p . v 7. 169 p
The capability of maintaining and automatic editing of case data has been provided. Phase I of the system automatically generates matrices for joining. symmetric/ antisymmetric disconnect. vibration. and stability analyses. Modules for converting continuous- to- discrete loads. analytic- to- discrete geometry. and a master case data file editor are provided to reduce input data requirements. Phase II of the system provides for the manipulation of matrices. The matrix operations include most of the basic matrix operations (e. g. . add. multiply. etc). several special matrix operations (e. g. . adjoin). and several control operations (e. g. . save matrices. conditional IF test. etc). Phase III of the system provides for self- explanatory report form printing of matrices and a nominal graphical display capability. including a geometric display.

ID NO.- EI70X159948 059948
Application of mechanical receptance coupling principle to spacecraft systems
HEER E: LUTES LD
California Inst of Technol. Pasadena
DESCRIPTORS- (•SPACE VEHICLES. •Vibrations). (SPACE VEHICLES. Testing).
CARD ALERT- 000
SOURCE- U S Naval Research Laboratory-Shock & Vibration Bul 38 pt 2 Aug 1968 p 239-48
This paper explores the use of mechanical receptances (frequency response functions) in determining the dynamic response of a system from subsystem characteristics. where the basic problem is considered to be that of joining together and determining the dynamic response of a number of components (e. g. space vehicle subsystems): discussion includes the problem of component resonance and a description of the Receptance Coupling Program. Problem of eliminating the effects of the measuring equipment from experimentally determined receptances is treated.

ID NO.- EI70X154960 054960
Mechanize aircraft handling
DEGROAT G
DESCRIPTORS- (•AIRCRAFT PLANTS. •Production Control). (MATERIALS HANDLING. Assembly).
IDENTIFIERS- CRAMES. MONORAIL
CARD ALERT- 652. 913
CODEN- AMMAA SOURCE- Amer Mach v 114 n 6 Mar 23 1970 p 104-6
Hankving skins by monorail is not new in aircraft production. but Northrop's Compton facility goes far beyond this in providing for the automatic handling of assembled panels with the overhead monorail carrying the work through every step of processing. Six main monorail lines carry the panels suspended by quick- disconnect clamps developed at Northrop- four clamps per panel- to the various work stations where lateral spur monorails take the work from one of the six main lines and deliver it to one of 28 subassembly jigs.

ID NO.- EI70X149569 049569
Characterization of piezoelectric transducers used in ultrasonic devices operating above 0.1 GHz
MEITZLER AH: SITTIG EK
Bell Telephone Lab Inc. Murray Hill. NJ
DESCRIPTORS- •TRANSDUCERS. PIEZOELECTRIC CRYSTALS.
IDENTIFIERS- ULTRASONIC DEVICES
CARD ALERT- 701. 752
SOURCE- J Appl Phys v 40 n 11 oct 1969 p 4341-52
Mason's equivalent circuit is used to critically appraise the validity of methods used to evaluate transducer performance from loss and admittance measurements made under conditions where performance of the transducers cannot be evaluated separated from the device. Computed families of curves are presented. spanning the practically important range of mechanical impedances and coupling factors. Experimental data from a ZnO film and a LiCbO/3 thin- plate transducer on fused quartz substrates are presented to demonstrate the application of equivalent circuit descriptions to obtain the coupling factors.

ID NO.- EI70X026308 026308
Multi-output contactless magnetic relays used in combination with transformers
KUTSYLO VK
DESCRIPTORS- •ELECTRIC RELAYS. ELECTRIC TRANSFORMERS.
CARD ALERT- 704
SOURCE- Izvestiya Vysshikh Uchebnykh Zavedenii. Energetika n 11 Nov 1969 p 15-18
The transformers concerned are able. besides fulfilling the usual transfromer functions. to disconnect groups of electrically disconnected circuits and to switch-on other groups. In Russian.

ID NO.- EI70X024511 024511
Direct buried transformers. Present and future
DECKER RM
Cleveland Electric Illuminating Co. Ohio
DESCRIPTORS- *ELECTRIC TRANSFORMERS. (ELECTRIC DISTRIBUTION. Underground). (METAL CORROSION. Cathodic Protection).
CARD ALERT- 704. 706
SOURCE- Pennsylvania Elec Assn-Eng Sec for meeting Bedford. Pa. Oct 1-2 1969 Appendix D. 7 p
Experience of Cleveland Electric Illuminating Co with underground distribution transformers. including those for city of Chicago. Ill. It is concluded that present day transformers in metal tanks can be direct buried and have the same load capability as pole mounted transformers. For the best corrosion protection it is necessary to have a good quality tank coating. disconnect the tank from the system neutral. and use either a magnesium or zinc anode for protection. Supplemental cooling is needed for the larger sizes of transformers.

ID NO.- EI70X020544 020544
Proceedings of the 1st international power transmission conference. Olympia. London. June 3- 4 1969
PROC
DESCRIPTORS- *POWER TRANSMISSION. CLUTCHES. BRAKES. BELTS.
CARD ALERT- 602
SOURCE- Engineers' Digest. London. England. 1969 (recd 1/5/70) various pagings
Proceedings include 1w papers relating to couplings. clutches. fluid couplings. brakes. gears. chain drives. bearings. v and wedge belt drives. flat belts and other forms of variable speed drives.

ID NO.- EI70X017150 017150
Thickness measurements of nonmetal products by natural decay of electromagnetic field
ERMAKOV AN: BRANDORF VG
DESCRIPTORS- *THICKNESS MEASUREMENT. (MATERIALS TESTING. Nondestructive). (MAGNETIC FIELDS. Measurement). ELECTRIC COILS
.
CARD ALERT- 422. 701
SOURCE- Soviet J of Nondestructive Testing (English translation of Defektoskopiya) n 1 Jan-Feb 1969 p 21-5
A method for measuring the thickness of nonmetal products in terms of the natural decay of the electromagnetic field is described. A theoretical investigation of the pattern of the magnetic field established by the ring current is reported. The feasibility of taking measurements in the absence of any mechanical coupling between emitter and receiver at the physical point is demonstrated. The possibility of achieving a low level of measurement error is reported.

ID NO.- EI70X015822 015822
Development of reduction gear with fluid coupling at Tsurumi shipyard
ETO H: SATO T: ARAI M
DESCRIPTORS- *LINGS. GEARS. SHIP PROPULSION-DIESEL.
CARD ALERT- 162. 295
SOURCE- Nippon Kokan Kabushiki Kaisha-Tech Report Overseas n 9 Mar 1969 p 61-70
Design and manufacture of reduction gear with fluid coupling have been completed. but many points are still left for future study as to dynamic transitional phenomena: it is planned to make efforts to achieve lighter gears at lower cost minimizing margins. through accumulation of data. simultaneously with study of above problems. In English.

ID NO.- EI70X008655 008655
Resonant charging technique simplifies ignition systems
CARLSTROM HD
Sanders Associates. Inc. Nashua. NH
DESCRIPTORS- (*AUTOMOBILE ENGINES. *Ignition Systems). (RADIO CIRCUITS. Switching).
CARD ALERT- 013. 100. 168
SOURCE- Electronic Design v 17 n 7 Apr 1 1969 p 82. 84
Many capacitor- discharge ignition systems suffer from spikes on h- v power supply: in units employing SCRs. these spikes can sometimes exceed dv/dt rating of SCR and breakdown occurs: transistor circuit can be used to disconnect SCR from power supply when SCR is OFF. but such circuits can be complex as well as expensive: simpler solution is to use resonant charging circuit. which provides high speed at low cost: output voltage of 55.000 v is obtained.

ID NO.- EI70X004272 004272
Influence of magnetic annealing on magnetomechanical coupling coefficient of Ni- Co ferrites as function of cobalt ion concentration
PRESNOVA LA: PONKRAT'EVA RI: FOMENKO LA
DESCRIPTORS- (*MAGNETIC MATERIALS. *Ferrites). NICKEL AND ALLOYS.
CARD ALERT- 057. 135. 140
SOURCE- Akusticheskii Zhurnal v 15 n 1 1969 p 116-20. See also English translation in Soviet Physics. Acoustics v 15 n 1 July-Sept 1969 p 92-5
Effect of variation of concentration of Co ions in Ni- Co ferrites with small excess of iron ions on efficiency of thermomagnetic annealing is discussed: it is shown that influence of latter on magneto- mechanical coupling coefficient of typical cores is determined by variation in rectangularity of hysteresis loop and by variation of anisotropy constant of ferrite. In Russian.

NASA PRINTOUTS

68N13510-# ISSUE 4 PAGE 526 CATEGORY 18 NASA-TM-X-53676
67/00/00 15 PAGES UNCLASSIFIED DOCUMENT
1 A PRELIMINARY EVALUATION OF SILANE COUPLING AGENTS AS PRIMERS AND ADDITIVES IN POLYURETHANE BONDING PROCEDURES
(SILANE COUPLING AGENTS USED AS PRIMERS, AND ADDITIVES FOR POLYURETHANE BONDING)
A/HILL, W. E.; B/THOMPSON, L. M.
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA. AVAIL.NTIS
/*METAL BONDING/*POLYURETHANE RESINS/*PRIMERS (COATINGS)/*RESIN BONDING/*SILANES/ ADDITIVES/ AMBIENT TEMPERATURE/ COUPLINGS/ CRYOGENICS/ FIBER STRENGTH/ LINKAGES

67B10335* CATEGORY 1 M-FS-11980 67/09/00 UNCLASSIFIED DOCUMENT
DOMESTIC
2 DEVICE ENABLES CALIBRATION OF MICROPHONES AT HIGH SOUND PRESSURE LEVELS
(COUPLING DEVICE ACCURATELY CALIBRATES MICROPHONES AT HIGH SOUND PRESSURE INTENSITIES. THE SYSTEM WHICH USES A LIQUID AS THE COUPLING MEDIUM CAN OPERATE IN AN AUTOMATIC MODE BY USING A STANDARD MICROPHONE AS A CONTROL SENSOR. FEEDBACK FROM THE STANDARD MICROPHONE CONTROLS THE CALIBRATION SIGNAL LEVEL.)
A/GILLEN, A.
/*AUTOMATIC CONTROL/*CALIBRATING/*CAVITIES/*CIRCULAR PLATES/*COUPLINGS/*DETECTORS/*DISPLACEMENT/*FEEDBACK/*FRUSTUMS/*HIGH PRESSURE/*LIQUIDS/*MICROP HONES/*NEEDLES/*NONLINEARITY/*PISTONS/*PRESSURE GAGES/*PRISMS/*SAFETY DEVICES/*SOUND INTENSITY/*VIBRATION

67B10256* CATEGORY 5 M-FS-2159 67/07/00 UNCLASSIFIED DOCUMENT
DOMESTIC
3 LINE ADAPTER PROVIDES QUICK DISCONNECT UNDER MODERATE SIDE LOADING
(LINE ADAPTER ACTS AS QUICK AND SIMPLE DISCONNECT SYSTEM. IT QUICKLY SEPARATES UPON THE APPLICATION OF A SIDE LOAD OF 15 POUNDS WITH STANDING LINE PRESSURE AT 100 PSIG.)
A/WOLFRAM, E. A.
/*ADAPTERS/*BALL BEARINGS/*CONNECTORS/*DISCONNECT DEVICES/*FLUID TRANSMISSION LINES/*HIGH PRESSURE/*LOCKS (FASTENERS)/*O RING SEALS/*RING STRUCTURES/*SPRINGS (ELASTIC)

66B10285* CATEGORY 5 MSC-600 66/06/00 UNCLASSIFIED DOCUMENT
DOMESTIC
4 HIGH PRESSURE TUBE COUPLING REQUIRES NO THREADS OR FLARES
(HIGH PRESSURE TUBE COUPLING CONNECTS TO ANY STRAIGHT, UNTHREADED, AND UNFLARED TUBING END WITHOUT DEFORMING OR DAMAGING THE TUBING. THE COUPLING GRIPS THE TUBE WALL TIGHTLY BETWEEN AN EXTERNAL COMPRESSION SLEEVE AND AN INTERNAL HOLLOW MANDREL. IT IS ADAPTABLE TO STANDARD SCREW FITTINGS FOR TEST STAND ATTACHMENT.)
A/STEIN, J. A.
/*COMPRESSING/*COUPLINGS/*DAMAGE/*DEFORMATION/*FLARED BODIES/*HIGH PRESSURE/*MANDRELS/*METAL JOINTS/*O RING SEALS/*PIPES (TUBES)/*RING STRUCTURES/*SLEEVES/*TEST STANDS/*THREADS

66B10275* CATEGORY 5 NU-0062 66/06/00 UNCLASSIFIED DOCUMENT
DOMESTIC
5 REMOTELY CONTROLLED SYSTEM COUPLES AND DECOUPLES LARGE DIAMETER PIPES
(REMOTE CONTROL, AIR-MOTOR DRIVEN, CHAIN-DRIVE SYSTEM ENGAGES AND DISENGAGES A FLANGE COUPLING FROM LARGE-DIAMETER, HIGH PRESSURE FLUID LINES.)
A/GRIFFIN, P. A.
/*CHAINS/*CONNECTORS/*COUPLINGS/*DISCONNECT DEVICES/*FLANGES/*FLUID TRANSMISSION LINES/*HIGH PRESSURE/*MECHANICAL DRIVES/*PIPES (TUBES)/*REMOTE CONTROL

66B10020* CATEGORY 5 M-FS-481 66/01/00 UNCLASSIFIED DOCUMENT
DOMESTIC
6 O-RING TUBE FITTINGS FORM LEAKPROOF SEAL IN HYDRAULIC SYSTEMS
(LEAKPROOF FITTINGS FOR HYDRAULIC SYSTEMS ARE DESIGNED TO BE WELDED TO THE ENDS OF THE TUBING TO BE JOINED AND MATED TO FORM A SEAL WITH ONE O-RING AT THE JOINT. SINCE THE FITTINGS ARE COUPLED AT ONLY ONE JOINT, THEY TEND TO BE MORE RELIABLE THAN STANDARD FITTINGS COUPLED AT TWO JOINTS.)
/*BOLTS/*COUPLINGS/*CRYOGENIC EQUIPMENT/*FITTINGS/*FLANGES/*FLARED BODIES/*HYDRAULIC EQUIPMENT/*LEAKAGE/*O RING SEALS/*PIPES (TUBES)/*WELDED JOINTS

71X72871* NASA-TM-X-66687 AD-873694L IDEP-336.68.50.90-N4-03
KSC-TR-115-0 65/12/28 22 PAGES UNCLASSIFIED DOCUMENT GOVT. AGCY
7 CARDAIR HIGH-PRESSURE COUPLINGS P/N 3510-0008
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. JOHN F. KENNEDY SPACE CENTER, COCOA BEACH, FLA.
/*COUPLINGS/*SATURN LAUNCH VEHICLES/*VIBRATION TESTS/ EQUIPMENT SPECIFICATIONS/ GROUND SUPPORT EQUIPMENT/ HIGH PRESSURE/ RESONANT FREQUENCIES

Rut Hoag 1-301-796-5300

69X76237 REPT-4 68/08/00 60 PAGES UNCLASSIFIED DOCUMENT NASA
8 EVALUATION OF AN OIL HYDRAULIC PIPE COUPLING
A/CROOK, A.; B/FISHER, M. J.
BRITISH HYDROMECHANICS RESEARCH ASSOCIATION, HARLOW (ENGLAND).; NATIONAL ENGINEERING LAB., EAST KILBRIDE (SCOTLAND).
PREPARED JOINTLY BY BHRA/NEL
/*COUPLINGS/*HYDRAULIC EQUIPMENT/*PIPES (TUBES)/ HIGH PRESSURE/ O RING SEALS/ OILS/ STATIC TESTS/ TABLES (DATA)

72A31695** ISSUE 15 PAGE 2213 CATEGORY 11 NAS10-7702 72/03/00
15 PAGES UNCLASSIFIED DOCUMENT
9 UMBILICAL CONNECT SYSTEMS.
(SPACE SHUTTLE UMBILICAL SYSTEMS FOR MATING, CONNECTION AND CHECKOUT OF CARRIER ASSEMBLIES AND COUPLINGS FOR CRYOGENIC, ELECTRICAL, PNEUMATIC AND HYDRAULIC SERVICES)
A/VALKEMA, D. A/(GENERAL DYNAMICS CORP., ST. LOUIS, MO.)
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS AND NASA, SPACE SHUTTLE OPERATIONS, MAINTENANCE, AND SAFETY TECHNOLOGY CONFERENCE, COCOA BEACH, FLA., MAR. 29, 1972, PAPER. 15 P.
/*CRYOGENIC EQUIPMENT/*ELECTRIC EQUIPMENT/*HYDRAULIC

AIA
212-867-8300 750 3rd Ave.

Tech. Inf. Services

EQUIPMENT/*PNEUMATIC EQUIPMENT/*SPACE SHUTTLES/*UMBILICAL CONNECTORS/
CONFERENCES/ COUPLINGS/ SPACE VEHICLE CHECKOUT PROGRAM
ABA D.F.L.
ABS UMBILICAL CONNECT SYSTEMS WERE STUDIED FOR THE PURPOSE OF DEVELOPING TECHNIQUES, SPECIFICATIONS, AND HARDWARE DESIGN CONCEPTS FOR PROTOTYPE SYSTEMS TO BE USED IN THE SPACE SHUTTLE PROGRAM. NEW TECHNIQUES ARE DESCRIBED WHICH PERMIT RAPID AND RELIABLE MATING, CONNECTION, AND CHECKOUT OF UMBILICAL CARRIER ASSEMBLIES AND COUPLINGS FOR VEHICLE SERVICES (CRYOGENIC, ELECTRICAL, PNEUMATIC, AND HYDRAULIC SYSTEMS).

69N21600 ISSUE 12 PAGE 1712 CATEGORY 15 BHRA-NEL-JOINT-REPT-4
68/03/00 46 PAGES UNCLASSIFIED DOCUMENT
10 EVALUATION OF AN OIL HYDRAULIC PIPE COUPLING
(PERFORMANCE OF OIL HYDRAULIC PIPE COUPLINGS UNDER MAXIMUM AND MINIMUM TOLERANCE CONDITIONS)
A/CROOK, A.
BRITISH HYDROMECHANICS RESEARCH ASSOCIATION, CRANFIELD (ENGLAND).
AVAIL.NTIS COPYRIGHT. AVAIL-
GLASGOW NATL. ENG. LAB. PREPARED JOINTLY WITH NATL. ENG. LAB., GLASGOW.
/*COUPLINGS/*HYDRAULIC EQUIPMENT/*O RING SEALS/*PERFORMANCE TESTS/*PIPES (TUBES)/ HIGH PRESSURE/ IMPULSES/ STATIC TESTS/ TEMPERATURE EFFECTS/ VACUUM EFFECTS

APPENDIX II

CORRESPONDENCE

FAIRCHILD
STRATOS DIVISION

October 7, 1976
I.610WPR82

Various - List Attached

Attention:

Subject: Fluid Disconnects for Space Transportation Systems

Gentlemen:

Fairchild Stratos Division (FSD) has been selected by the NASA to conduct a study to develop and qualify a fluid disconnect for Space Transportation Systems. The intent of this program, (Contract NAS 8-32806) is to provide a disconnect design from existing industry hardware, capable of servicing a wide range of orbiting payloads.

Because the intended scope of potential applications is very broad, a family of disconnects, similar in design but adapted for specific media, temperature, etc. may emerge. In all cases, low leakage and minimum engagement, retention, and separation forces will be primary design drivers.

Fairchild Stratos has been directed by the subject contract to survey leading suppliers of aerospace disconnect hardware in search of applicable concepts and components. The modification of existing hardware to meet Space Transportation Systems requirements will be strongly considered. Any contribution, whether conceptual, test data, or hardware will be fully credited in the final report. Disclosures will be brought to the attention of interested NASA personnel. Contributors will be listed in, and given copies of, the final report.

If you wish to participate in this long range program, which Fairchild Stratos feels has great potential, please submit appropriate test data, assembly drawings, conceptual sketches, etc. A summary of basic requirements is attached to assist you in selecting items for submittal. Designs or concepts useful in satisfying all or part of these requirements will be of interest. To be of the most use, your reply should be received not later than December 1st, 1976. You may wish to submit an existing disconnect which can be used directly or modified to meet the enclosed criteria. Fairchild Stratos would, of course, expect to write a Purchase Order for the procurement of actual hardware.

October 7, 1976
L610WPR82

In the event that you plan not to respond affirmatively, we would appreciate a reply confirming that intent.

If you have any questions, or wish to discuss technical aspects and implications of the program, please call Jere Vandewalle, Project Engineer, at (213) 675-9111, Ext. 317, or the undersigned at Ext. 450.

Very truly yours,

FAIRCHILD STRATOS DIVISION

WPRigsby 10-7-76
W. P. Rigsby
Program Manager

WPR:hb

Enclosure

BASIC REQUIREMENTS

NASA SPACE TRANSPORTATION SYSTEMS FLUID DISCONNECTS

1. Classification: Class 1 ~ Low Pressure, self-sealing, automatic open/close
   Class 2 ~ High Pressure, self-sealing, automatic open/close
2. Size: 1/4 Inch to 1-Inch
3. Fluids: Class 1 ~ Liquid Hydrogen
   Class 2 ~ Inert gases (He, N_2, etc.)
4. Pressure: Class 1 ~ 100 psia (maximum operating)
   Class 2 ~ 3000 psia (maximum operating)
   Proof factor: 1.5x Burst factor: 2.0x
5. Temperature: Class 1 ~ -423° F to +150° F.
   Class 2 ~ -150° F to +250° F.
6. Leak Rates: Class 1 Room Temperature: 1×10^{-4} sccs GHe
   (mated & Unmated) -423° F: 0.1 sccs GHe
   Class 2 Room Temperature: 0.1 sccs GHe
7. Spillage: To be minimized (interface enclosed volume)
8. Separation Force: Pressure effects on engage/disengage forces and on separation force while connected must be minimized.
9. Alignment: Self aligning within ± 5° conical and 1/16 inch offset
10. Life/Endurance: 10 years and 500 cycles

FAIRCHILD
STRATOS DIVISION
1800 ROSECRANS AVENUE
MANHATTAN BEACH, CALIF. 90266

LETTER MAILED TO THE FOLLOWING ADDRESSEES ON 10-7-76:

1. J. C. Carter Company
671 W. 17th Street
Costa Mesa, Calif. 92626
ATTN: Nelson A. May
Marketing Manager

2. Royal Industries, Inc.
2040 Dyer Road
Santa Ana, Calif. 92705
ATTN: H. J. Patrick
V.P., Marketing

3. Consolidated Controls Corp.
15 Durant Avenue
Bethel, Conn. 06801
ATTN: Marketing Manager

4. Consolidated Controls Corp.
2338 Alaska Avenue
El Segundo, Calif. 90245
ATTN: H. A. Waller
Marketing Manager

5. AMETEC - Calmec Division
8401 E. Slauson Avenue
Pico Rivera, Calif. 90660
ATTN: Keith Rogers
Marketing Manager

6. Marotta Scientific Controls, Inc.
770 Boonton Avenue
Boonton, New Jersey 07005
ATTN: William T. Browne
Sales Manager

7. Hamilton Standard
United Aircraft Corporation
Windsor Locks, Conn. 06096
ATTN: Robert E. Breeding
Manager, Space Systems

8. Val Cor Engineering Corp.
365 Carnegie Avenue
Kenilworth, New Jersey
ATTN: Marketing Manager

9. Parker-Hannifin Corp.
18321 Jamboree Road
Irvine, Calif. 92644
ATTN: W. G. Webster
V.P., Marketing
Aerospace Group

10. Lear Siegler, Inc.
Romec Division
241 So. Abbe Road
Elyria, Ohio 44035
ATTN: D. J. Webster
Marketing Manager

11. Purolator California
950 Rancho Conejo Blvd.
Newbury Park, Calif. 92320
ATTN: Barry B. Willis
President

FAIRCHILD
STRATOS DIVISION

October 29, 1976
EC76:294

Subject: Requirements for Payload Fluid Disconnects

Sir:

Fairchild Stratos Division (FSD) is conducting a program under NASA Contract NAS 8-32806 to develop and qualify fluid disconnects in support of Space Transportation Systems (STS). The intent of this program is to provide a unit, or family of units, capable of servicing a wide range of orbiting payloads. Servicing, in this context, implies orbital mating of the Shuttle Orbiter with a satellite, followed by modular replacement and/or replenishment of satellite subsystems or experiments. The fluid disconnect as such becomes a key element in the success of orbital servicing operations.

The types of fluids generally include propellants, pressurants, and coolants, as typically used in subsystems for attitude control, thermal conditioning, special experiments, etc. The use of fluid disconnects as part of an integrated orbital servicing concept provides capability for replenishment, mixing, or even exchange of onboard fluids. This additional flexibility can be utilized to extend satellite orbital lifetime, increase payload, vary experiments, etc.

To provide the most useful disconnects for such a broad range of applications, full understanding of potential requirements is necessary. Accordingly, Fairchild Stratos has been advised by the contracting agency (NASA-MSFC) to contact potential satellite and payload contractors to discuss anticipated fluid requirements. These include all significant parameters, such as fluid type, operating pressure, mission life, allowable leakage, etc.

Any assistance you might provide in terms of definition of fluid requirements would be appreciated, and would be fully credited in the final report. We would welcome an opportunity for a face-to-face meeting and discussion of anticipated requirements at your convenience. In any event, we request that your reply be received not later than 15 December 1976. If you wish to contact us by phone, or if you have any questions regarding the technical aspects of the program, please contact the undersigned at (213) 675-9111, extension 317, or Mr. M. Baniadam at extension 217.

Very truly yours,

FAIRCHILD STRATOS DIVISION

J. M. Vandewalle

J. M. Vandewalle
Project Engineer

JMV:dp

PAYLOAD CONTRACTORS

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   Convair Division
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   San Diego, California 92138

7. Elmer Frey
   Sherman Fairchild Technology Center
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   Germantown, Maryland 20767

8. Gary D. Gordon, Project Manager
   Communications Satellite Corporation
   COMSTAT Laboratories
   Clarksburg, Maryland 20734

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STRATOS DIVISION
1800 ROSECRANS AVENUE
MANHATTAN BEACH, CALIF., 90266

APPENDIX III

DEVELOPMENT TEST PROCEDURE ER 76300-2

DOCUMENT NUMBER ER 76300-2

DEVELOPMENT TEST PROCEDURE
SPACE TRANSPORTATION SYSTEMS DISCONNECT
FOR
NASA GEORGE C. MARSHALL SPACE FLIGHT CENTER
PART NOS. 76300101-501 AND 76300001-501

Prepared by: J. M. Vandewalle 25 May '77
J. M. Vandewalle, Project Engineer

Approved by: S. Mu 5/26/77
S. Mu, Sr. Project Engineer

16 May 1977

FAIRCHILD
STRATOS DIVISION

1800 ROSECRANS AVENUE MANHATTAN BEACH CALIF 90266

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STRATOS DIVISION
1800 ROSECRANS AVENUE
MANHATTAN BEACH, CALIF. 90266

1.0 SCOPE

This document describes the development test procedure applicable to the subject disconnects, FSD Part Nos. 76300101-501 and 76300001-501.

1.1 Test Specimens

Two prototype test specimens as follows will be used for the development test program:

Description	FSD Part Number
1/2 Inch Orbital Servicing Module Ass'y	76300001-501
1/2 Inch Orbital Servicing Spacecraft Ass'y	76300101-501

1.2 Objectives

Testing shall be performed to provide the necessary confidence that the disconnects will meet all specification requirements, and to explore the limits of the design capability.

2.0 APPLICABLE DOCUMENTS

The following documents of the exact issue shown, form a part of this plan to the extent referenced. Contents of the plan shall take precedence over any conflicting portions of these documents.

Military

MIL-STD-810B (4) 21 September 1970	Environmental Test Methods
MIL-C-45662A 9 February 1967	Calibration System Requirements
MIL-P-27401B 19 September 1962	Propellant, Pressurizing Agent Nitrogen
MIL-P-27407 8 January 1965	Propellant, Pressurizing Agent Helium
MIL-P-27201B 30 June 1971	Propellant Hydrogen

Industry

AMS 3159 — Leak Test Solution
1 November 1967

Fairchild Stratos

ER 73325-24, B Rev. — Contamination Control Plan
15 September 1975

3.0 GENERAL REQUIREMENTS

3.1 Test Facilities

All testing shall be accomplished at Stratos Division, except where local safety requirements, specialized environmental testing, or equipment capacity demand the use of an approved outside laboratory source.

3.1.1 Test Data Documentation

All test data results obtained during tests at Stratos Division shall be recorded on data sheets provided in Appendix I of this procedure. One complete set is included. Additional copies can be made as required to perform complete development testing of all test specimens. All original test data sheets shall be kept in one book or file and be immediately available. All data sheets are to be signed by the data taker and another engineer for accuracy and reasonableness. All testing reports from approved outside source and Stratos shall include all pertinent data and photographs of both setups and specimen duly annotated.

3.1.2 Test Deviations

Any deviations in test or performance from allowable limits shall be immediately reported. No adjustments, repairs or maintenance shall be made to the specimen without prior approval of the Project Engineer.

3.1.3 Test Equipment Certification

All equipment shall be certified in accordance with MIL-C-45662A. A record of equipment used shall be maintained to include the following:

Name of equipment

Model number

Serial number

Manufacturer

Certification and accuracy

Frequency of calibration

Range

3.1.4 Test Media

GN_2	Propellant, Pressurizing Agent Nitrogen per MIL-P-27401B
GHe	Helium, Bureau of Mines, Grade A-Oil Free or MIL-P-27407, Propellant Pressurizing Agent Helium
LH_2	MIL-P-27201B, Propellant Hydrogen
LN_2	MIL-P-27401C, Type I, Grade A

3.1.5 Test Tolerances - (Unless Otherwise Specified)

Pressure	1%
Temperature	5%
Time	5%
Flow	2%
Vibration Frequency Bandwidth	2%
Spectral Density	2db

3.1.6 Cleanliness

The cleanliness of the test equipment and fixtures shall be maintained in accordance with Stratos Specification SWP-209.

3.1.7 Safety Procedure

Safety procedures shall be observed at all times without exception. All normal laboratory practices applicable to pressure vessels and cryogenic testing shall be observed.

3.1.8 Test System Leak Check

All test system fittings shall be bubble-tight, using leak check solution per AMS 3159. The leak test shall be performed with GHe at specimen operating pressures as follows:

Operating pressure 300 ± 10 psig

3.1.9 Low Temperature Testing

Whenever the test specimen is being chilled or being warmed from a chilled condition, the test unit shall be pressurized or purged at 5 psig minimum pressure.

3.1.10 Units

Pounds per square inch gage	psig
Pounds per square inch absolute	psia
Standard cubic centimeters per second	sccs

4.0 DETAIL REQUIREMENTS

The prototypes will be subjected to development tests as outlined in Table I. Necessary deviations from the indicated sequence may be made at the discretion of the Project Engineer.

4.1 Examination of Product

Examine the disconnect halves carefully prior to initiation of development testing and record on the data sheets provided their weights and any non-conformances to applicable drawings.

4.2 Proof Pressure

4.2.1 Unmated Proof - Module Half Disconnect (MHD)

Place the unmated MHD in a proof test chamber connected by its flex hose to a pressure source of GN_2 or GHe. Apply 440 ± 10 psig through the flex hose to the MDH for a minimum period of five minutes. Remove the pressure and visually inspect the unit for permanent deformation. No permanent deformation is permitted.

4.2.2 Unmated Proof - Spacecraft Half Disconnect (SHD)

Repeat 4.2.1 using the SHD.

4.2.3 Mated Proof - Disconnect

Install the SHD and the MHD in the 76300901 test fixture as shown in Figure 1. Connect to the test control panel. Using the fixture drive, mate the halves of the disconnect. At a maximum rate of 100 psig per minute, apply 440 ± 10 psig to the mated disconnect. Observe the test fixture for deformation and/or any slippage of the ball screw drive. If either occurs, terminate the test, immediately reduce pressure to zero, and make appropriate modifications before proceeding. When the required 440 ± 10 psig is reached, maintain pressure for a minimum period of five minutes. Remove the pressure and visually inspect the disconnect for permanent deformation. None is permitted.

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MANHATTAN BEACH, CALIF., 90266

TABLE I

DEVELOPMENT TEST PLAN

Description of Test	Paragraph
Examination of Product	4.1
Proof Pressure	4.2
Leakage	4.3
Functional	4.4
Flow and Pressure Drop	4.5
Interface Volume	4.6
Life Cycle	4.7
Vibration	4.8
Burst	4.9
Post Test Inspection	4.10

4.3 Leakage

4.3.1 Ambient Temperature Leakage

Perform the ambient temperature leak tests at 75 ± 20 °F.

4.3.1.1 Ambient Temp Leakage - SHD

Install the SHD and its leak test fixture (76300904) as shown in Figure 2. Connect leak test fixture port to leakage test carousel. Cap the 1/8" NPT vent port and apply 50 psig to the SHD 1/2" flow port. If there is no indication (on the smallest flowrator tube) of leakage, disconnect the carousel, and connect the test fixture port to a Nordquist Mark II or to a mass spectrometer. Maximum allowable leak rate is 1×10^{-4} sccs. If there is an indication of leakage on the carousel, stop the test, disassemble the unit, inspect the sealing surfaces and examine the seals. Determine the cause of the excessive leak rate before proceeding. Measure leak rates at 50 ± 5 psig increments from 50 to 300 ± 10 psig and record the data. Uncap the 1/8" vent port and remove the SHD and its leak test fixture.

4.3.1.2 Ambient Temp Leakage - MHD

Install the MHD and its leak test fixture (76300902) as shown in Figure 3. Connect the sleeve seal leak port on the test fixture to the leakage test carousel. Apply 50 ± 5 psig to the MHD 1/2" flow port. Repeat 4.3.1.1 using the MHD and its leak test fixture with the carousel, Nordquist Mark II, or mass spectrometer.

4.3.1.3 Ambient Temp Leakage - Interface

Remove the 76300902 leak test fixture and install the 76300903 spacer on it. Reinstall the assembly of the 76300902/76300903 leak test fixture and spacer and repressurize the MHD. Connect the interface seal leak port on the test fixture to the leakage test carousel. Apply 50 ± 5 psig to the MHD 1/2" flow port. If there is no indication of leakage on the smallest flowrator tube, disconnect the carousel, and connect the leak port to a Nordquist Mark II or to a mass spectrometer. Maximum allowable leak rate is 1×10^{-4} sccs. Determine cause of excessive leakage, if any, before proceeding. Measure and record leak rates at 50 ± 5 psig increments up to 300 ± 10 psig.

4.3.2 High Temperature Leakage

Place the 76300901 fixture in an environmental chamber or insulated box as shown in Figure 4. Apply heat input to the interior of the chamber where the fixture and the prototypes are located. Perform the High Temp Leakage tests at 75, 125, 175, and 225 ± 25°F.

4.3.2.1 High Temp Leakage - SHD

Repeat 4.3.1.1 at each temperature level except check only three pressure levels: 50 ± 5, 150 ± 5, and 300 ± 10 psig. Do not proceed beyond a level where 1.0 sccs leak rate is reached. Conclude the test by rechecking and recording ambient leakage at 50 ± 5, 150 ± 5, and 300 ± 10 psig.

4.3.2.2 High Temp Leakage - MHD

Repeat 4.3.1.2 at each temperature level except check only three pressure levels: 50 ± 5, 150 ± 5 and 300 ± 10 psig. Do not proceed beyond a level where 1.0 sccs leak rate is reached. Conclude the test by rechecking and recording ambient leakage at 50 ± 5, 150 ± 5, and 300 ± 10 psig.

4.3.2.3 High Temp Leakage - Interface

Repeat 4.3.1.3 at each temperature level except check only three pressure levels: 50 ± 5, 150 ± 5 and 300 ± 10 psig. Do not proceed beyond a level where 1.0 sccs leak rate is reached. Conclude the test by rechecking and recording ambient leakage at 50 ± 5, 150 ± 5, and 300 ± 10 psig.

4.3.3 Low Temperature Leakage

Cool the environmental chamber interior where the fixture and prototypes are located. Perform the Low Temp Leakage tests at 75, 50, 25, 0, -25, and -50 $\pm$ 5°F.

4.3.3.1 Low Temp Leakage - SHD

Repeat 4.3.1.1 at each temperature level except check only three pressure levels: 50 $\pm$ 5, 150 $\pm$ 5, and 300 $\pm$ 10 psig. Conclude the test by rechecking and recording ambient leakage at 50 $\pm$ 5, 150 $\pm$ 5, and 300 $\pm$ 10 psig.

4.3.3.2 Low Temp Leakage - MHD

Repeat 4.3.1.2 at each temperature level except check only three pressure levels: 50 $\pm$ 5, 150 $\pm$ 5, and 300 $\pm$ 10 psig. Conclude the test by rechecking and recording ambient leakage at 50 $\pm$ 5, 150 $\pm$ 5, and 300 $\pm$ 10 psig.

4.3.3.3 Low Temp Leakage - Interface

Repeat 4.3.1.3 at each temperature level except check only three pressure levels: 50 $\pm$ 5, 150 $\pm$ 5, and 300 $\pm$ 10 psig. Conclude the test by rechecking and recording ambient leakage at 50 $\pm$ 5, 150 $\pm$ 5, and 300 $\pm$ 10 psig.

4.4 Functional Testing

Install the SHD and the MHD in test fixture 76300801 as shown in Figure 5 for functional testing.

4.4.1 Engage/Disengage

With the SHD and MHD installed at nominal alignment but disengaged, actuate the electric motor ball screw drive and engage the disconnect halves. Observe carefully for any indication of jamming or binding. Stop immediately if any improper engagement becomes evident and investigate before continuing.

Once full engagement is properly achieved, reverse the motor drive and fully disengage the disconnect halves. Repeat the engage/disengage cycle and record the readings indicated by the force washers. Also record drive motor current and voltage.

4.4.1 Engage/Disengage (continued)

Apply 50 ± 5 psig to the MHD and repeat the engage/disengage cycle. Record the force washer readings. Repeat at 50 ± 5 psig increments to 300 ± 10 psig.

Reinstall the MHD at 3° misalignment and .060 offset. Repeat 4.4.1 under misaligned conditions.

4.4.2 Thermal Capability - Low Limit

Reinstall the 76300901 fixture in the environmental chamber per Figure 4 with the disconnect halves in the misaligned position. Cool the interior of the chamber in -25 ± 5 °F increments from ambient to -50 °F or the lowest practicable temperature, whichever occurs first. At each temperature perform an engage/disengage cycle, beginning each cycle with the units disengaged. Perform one cycle with each of the following pressure combinations at each temp and record the forces indicated by the force washers.

MHD	SHD
300	0
300	150
300	300

4.4.3 Thermal Capability - High Limit

Repeat 4.4.2 except heat the interior of the chamber in 25 ± 5 °F increments from ambient to +250 ± 10°F or the highest practicable temperature, whichever occurs first. Remove environmental chamber following test.

4.5 Flow and Pressure Drop

With the SHD and MHD engaged at the maximum separation position connect the MHD 1/2" flow port to a pressurized water reservoir. Install a 0-100 psig Δ P gage across the disconnect inlet and outlet. Connect the SHD 1/2" flow port to a 1/2" full flow capability ball valve with 1/2" Ø.D. x .058 tubing and the ball valve to a 0-20 GPM water flowmeter. Pressurize the water reservoir to its operating pressure or 300 psig ± 10 psig, whichever is lower. Using the ball valve to regulate flow, increase flow in 2.0 ± 0.5 GPM increments until full flow is reached with the ball valve full open. Record the flows and corresponding Δ P values. Make two runs to verify data accuracy.

4.5 Flow and Pressure Drop (continued)

Repeat the above test with the SHD and MHD engaged at the nominal separation distance.

4.6 Interface Volume

Close the ball valve leading to the flowmeter. Place an open topped container under the interface area of the mated disconnect. Bleed off trapped gas bubbles from the setup. Use the ball screw drive to engage and disengage the SHD and MHD 100 times. Catch and retain the water which spills from the disconnect at each cycle. Make an accurate measurement of the total volume captured at 10, 50, and 100 cycles, and record the values.

4.7 Life Cycle

With the SHD and MHD installed at maximum misalignment in the 76300901 fixture, perform the required life cycle testing.

4.7.1 Life Cycle - Ambient Temp

Pressurize the MHD to 300 $\pm$ 10 psig. Repeat 4.3.1 prior to, and following, the 100 cycles. Environmental temperature must be 75 $\pm$ 20°F. Perform 100 engage/disengage cycles, venting the SHD to zero pressure during the disengaged position of the cycle. Maintain 300 $\pm$ 10 psig on the MHD throughout the test.

Repeat the test except vent the SHD only to 150 $\pm$ 25 psig during the disengaged portion of the cycle.

4.7.2 Life Cycle - Low Temp

Reinstall the 76300901 fixture in the environmental chamber per Figure 4. Cool the interior to -50 °F or to the lowest practicable temperature, whichever occurs first, and repeat 4.7.1 except perform 75 engage/disengage cycles instead of 100 at each of the two SHD vent settings. Repeat 4.3.1, except at the low temperature, prior to, and following the 75 cycles.

4.7.3 Life Cycle - High Temp

Heat the interior of the environmental chamber to +250 °F or the highest practicable temperature, whichever occurs first, and repeat 4.7.1 except perform 75 engage/disengage cycles instead of 100 at each of the two SHD vent settings. Repeat 4.3.1, except at the high temperature, prior to, and following the 75 cycles.

4.8 Vibration

Install the mated disconnect in the vibration test fixture furnished by outside test facility and pressurize it to 300 $\pm$ 10 psig. Subject the mated disconnect to the following vibration levels for 14 minutes each in the radial and axial direction.

FREQUENCY RANGE (Hz)	ACCELERATION SPECTRAL DENSITY
20-40	Increasing at 6 dB/octave
40-150	0.5 g^2/Hz
150-2000	Decreasing at 6 dB/octave

Repeat 4.3.1 at the conclusion of vibration testing.

4.9 Burst

Using the vibration test fixture if suitable or other specially designed burst test fixture, pressurize the mated disconnect to 600 $^{+0}_{-25}$ psig, for a minimum of five minutes. Depressurize to zero and examine the disconnect for distortion. If none is evident, disengage the SHD and the MHD and pressurize each to 600 $^{+0}_{-25}$ psig for a minimum of five minutes. Depressurize to zero and examine the halves for distortion.

Repeat the above test at 900 psig, and then at 1200 psig. Permanent deformation during any portion of the burst test is allowable, but the test should be terminated short of actual fracture if possible. The highest pressure which does not cause distortion and the highest overall test pressure should both be recorded.

4.10 Post Test Inspection

Disassemble, measure, and visually inspect the disconnect, component parts and seals. Record any evidence of distortion, wear contamination, etc.

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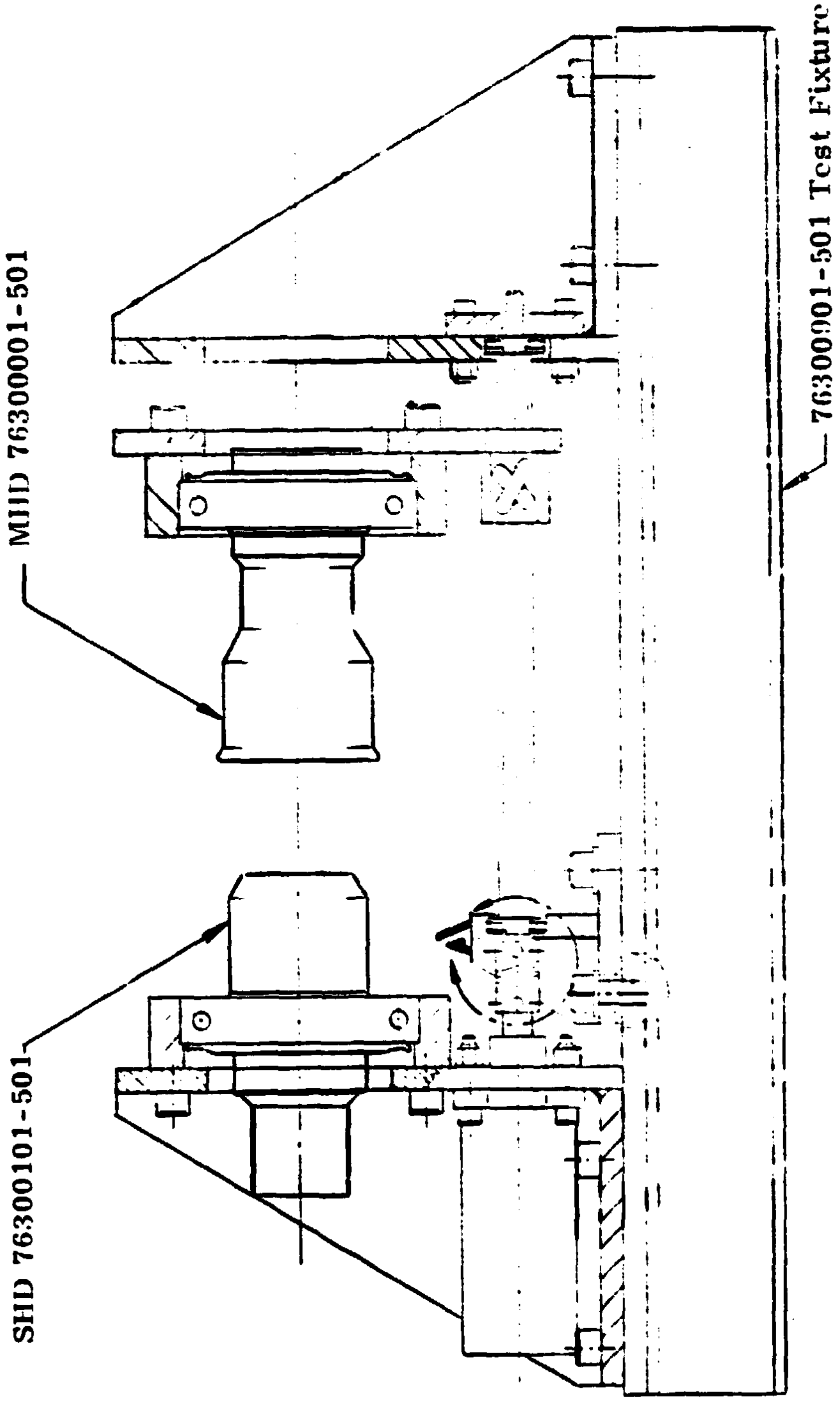

Figure 1. SHD/MHD Test Fixture

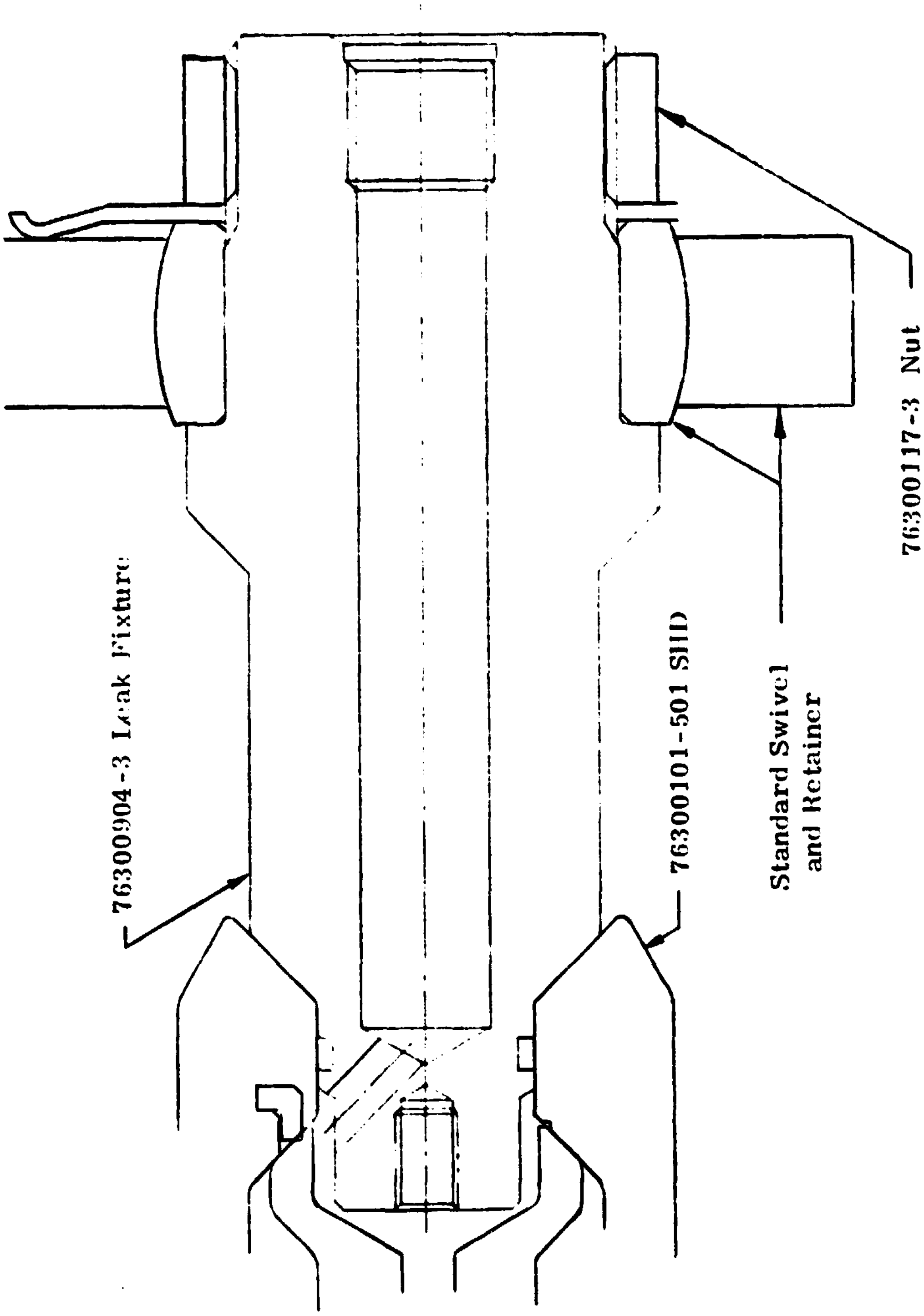

Figure 2. SHD Leak Fixture

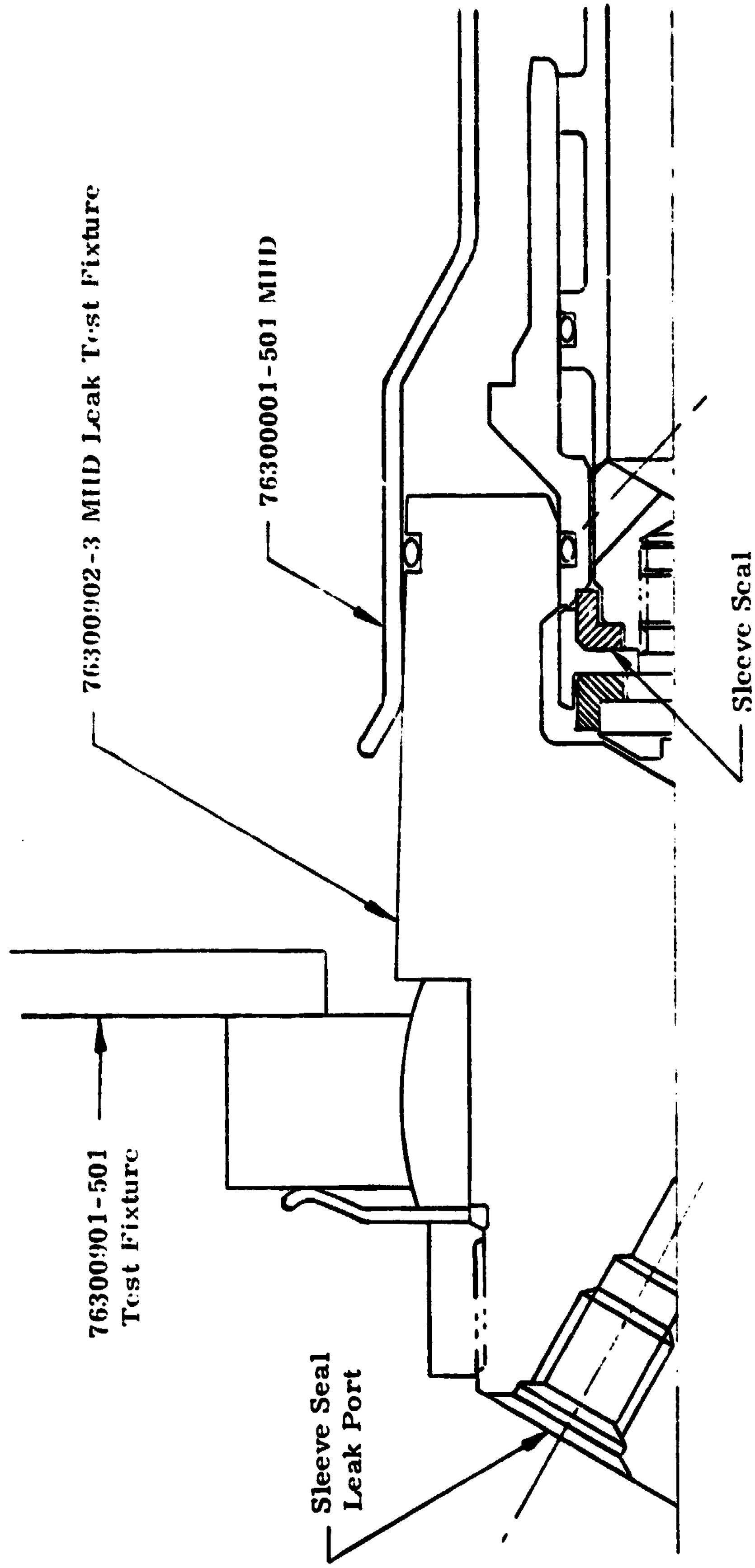

Figure 3. MHD Leak Fixture

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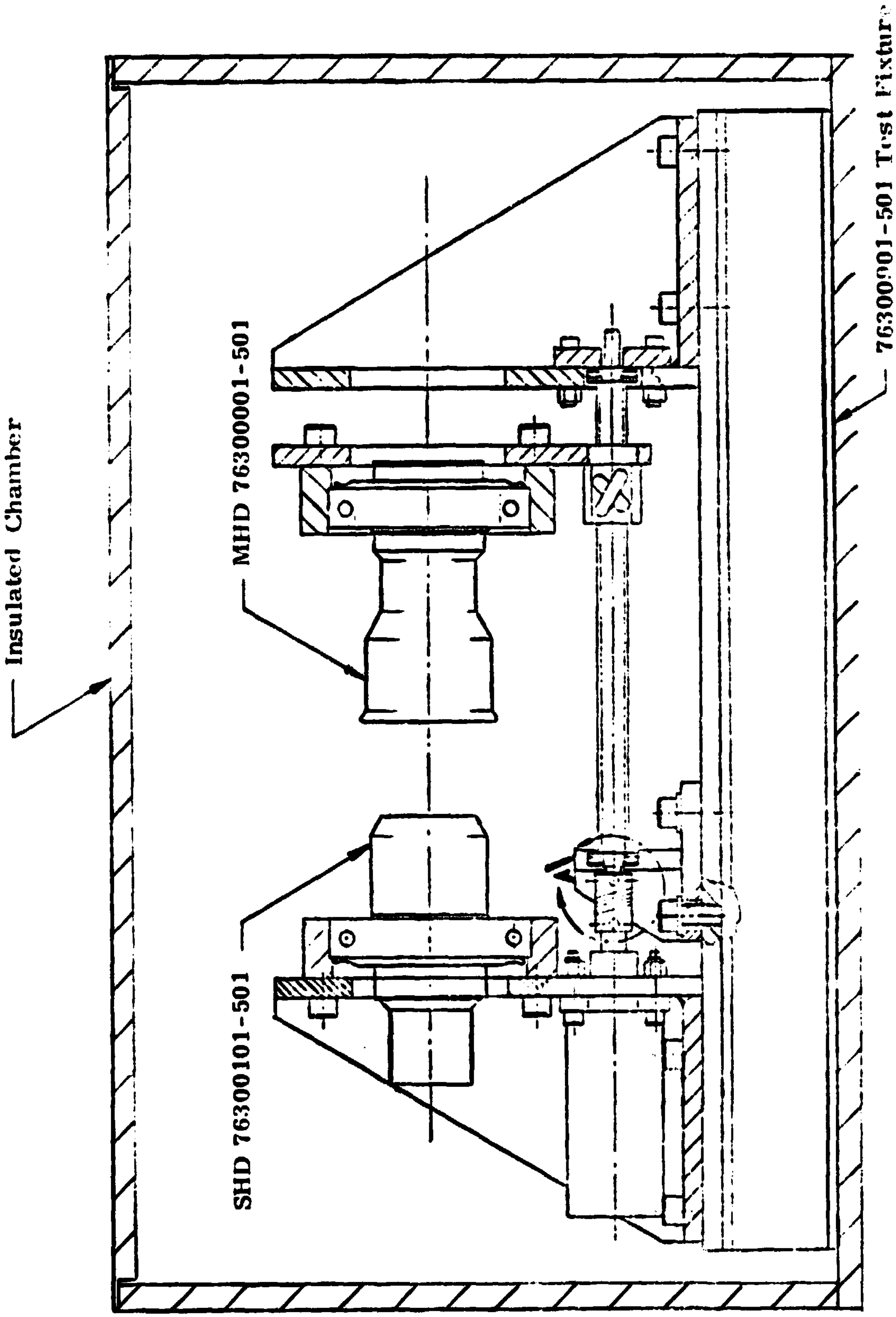

Figure 4. Environmental Test Fixture

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APPENDIX I

TEST LOGS - DATA SHEETS

76300001-501 AND 76300101-501 ORBITAL SERVICING DISCONNECTS

TEST LOG

ORBITAL SERVICING DISCONNECTS P/NS 76300001-501 & 76300101-501

4.1 Examination of Product

Remarks: ______

______

______

4.2.1 Unmated Proof Test 76300001-501 Module Half Disconnect (MHD)

___ psig applied for ___ minutes.

Permant deformation detected? ___

4.2.2 Unmated Proof Test 76300101-501 Spacecraft Half Disconnect (SHD)

___ psig applied for ___ minutes.

Perman nt deformation detected? ___

4.2.3 Mated Proof Test

___ psig applied for ___ minutes.

Permanent deformation detected? ___

4.3.1.1 Ambient Temp Leakage - SHD

Temp ___ °F 1/8" NPT VENT PORT CAPPED? ___

Pressure, psig	Leak Rate, sccs
___	___
___	___
___	___
___	___
___	___
___	___

1/8" NPT VENT PORT UNCAPPED? ___

4.3.1.2 Ambient Temp Leakage - MHD

Temp ___ °F

REMARKS: ______

TESTER ______

4.3.1.2 (cont)

Pressure, psig	Leak Rate, sccs

4.3.1.3 Ambient Temp Leakage - Interface

Temp ____ °F

Pressure, psig	Leak Rate, sccs

4.3.2.1 High Temp Leakage - SHD

Temp, °F	Pressure, psig	Leak Rate, sccs	Temp, °F	Pressure, psig	Leak Rate sccs

REMARKS: ____

TESTER ____

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TEST LOG

SHEET 3 OF 14

4.3.2.2 High Temp Leakage - MHD

Temp, °F	Pressure, psig	Leak Rate, sccs	Temp, °F	Pressure, psig	Leak Rate, sccs

ORIGINAL PAGE IS OF POOR QUALITY

4.3.2.3 High Temp Leakage - Interface

Temp, °F	Pressure, psig	Leak Rate, sccs	Temp, °F	Pressure, psig	Leak Rate, sccs

4.3.3.1 Low Temp Leakage - SHD

Temp, °F	Pressure, psig	Leak Rate, sccs	Temp, °F	Pressure, psig	Leak Rate, sccs

REMARKS: ____________________

TESTER ____________________

4.3.3.1 (cont)

Temp, °F	Pressure, psig	Leak Rate, secs	Temp, °F	Pressure, psig	Leak Rate, secs

4.3.3.2 Low Temp Leakage - MHD

Temp, °F	Pressure, psig	Leak Rate, secs	Temp, °F	Pressure, psig	Leak Rate, secs

4.3.3.3 Low Temp Leakage - Interface

Temp, °F	Pressure, psig	Leak Rate, secs	Temp, °F	Pressure, psig	Leak Rate, secs

REMARKS ______

TESTER ______

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TEST LOG

4.3.3.3 (cont.)

Temp, °F	Pressure, psig	Leak Rate, secs	Temp, °F	Pressure, psig	Leak Rate, secs

4.4.1 Engage/Disengage

Pressure, psig	Force Washer Readings		MOTOR Current	Voltage	Alignment	Cycle #

REMARKS:

TESTER

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TEST LOG

4.4.2 Thermal Capability - Low Limit (Misalyned conditions)

Temp, °F	Pressure, psig MHD	SHD	Force Washer Readings		Motor Current	Voltage	Cycle #

REMARKS:

TESTER:

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TEST LOG

4.4.3 Thermal Capability - High Limit (Misaligned Conditions)

Temp °F	Pressure, psig MHD	SHD	Force Washer Readings		MOTOR Current	Voltage	Cycle #

REMARKS:

TESTER

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4.5 Flow and Pressure Drop

SHD / MHD Separation Distance ________ in. (max.)

Run #	Reservoir Pressure, psig	ΔP psid	Flow GPM	Run #	Reservoir Pressure, psig	ΔP psid	Flow GPM

REMARKS: ____________________

TESTER ____________________

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4.5 Flow and Pressure Drop (cont.)

SHD / MHD Separation Distance ______ in. (nom.)

Run #	Reservoir Pressure, psig	ΔP psid	Flow GPM	Run #	Reservoir Pressure, psig	ΔP psid	Flow GPM

REMARKS: ______

TESTER ______

4.6 Interface Volume

Cycle #	Measured Volume cc	in^3

4.7.1 Life Cycle - Ambient Temp

a) Pre-cycling Leak Test

SHD (vent port capped)		MHD (vent port uncapped)		INTERFACE	
PRESS psig	LEAKAGE secs	PRESS psig	LEAKAGE secs	PRESS psig	LEAKAGE secs

b) Cycling Test

Temp °F	Pressure, psig MHD	SHD	Cycle #

REMARKS:

TESTER

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TEST LOG

c) Post-cycling Leak Test

SHD (vent port capped)		MHD (vent port uncapped)		INTERFACE	
PRESS psig	LEAKAGE sccs	PRESS psig	LEAKAGE sccs	PRESS psig	LEAKAGE sccs

4.7.2 Life Cycle – Low Temp

a) Pre-cycling Low Temp Leak Test

SHD (vent port capped)			MHD (vent port uncapped)			INTERFACE		
TEMP °F	PRESS psig	LEAKAGE sccs	TEMP °F	PRESS psig	LEAKAGE sccs	TEMP °F	PRESS psig	LEAKAGE sccs

b) Cycling Test

Temp °F	Pressure, psig MHD	Pressure, psig SHD	CYCLE #

REMARKS: ______________________

TESTER ______________________

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TEST LOG

c) Post Cycling Leak Test (Low Temp)

SHD (vent port capped)			MHD (vent port uncapped)			INTERFACE		
TEMP °F	PRESS psig	LEAKAGE secs	TEMP °F	PRESS psig	LEAKAGE secs	TEMP °F	PRESS psig	LEAKAGE secs

4.7.3 Life Cycle – High Temp

a) Pre-cycling High Temp Leak Test

SHD (vent port capped)			MHD (vent port uncapped)			INTERFACE		
TEMP °F	PRESS psig	LEAKAGE secs	TEMP °F	PRESS psig	LEAKAGE secs	TEMP °F	PRESS psig	LEAKAGE secs

b) Cycling Test

Temp °F	Pressure, psig MHD	Pressure, psig SHD	CYCLE #

REMARKS: ______

TESTER ______

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c) Post Cycling High Temp Leak Test

SHD (vent port capped)			MHD (vent port uncapped)			INTERFACE		
TEMP °F	PRESS psig	LEAKAGE sccs	TEMP °F	PRESS psig	LEAKAGE sccs	TEMP °F	PRESS psig	LEAKAGE sccs

4.8 Vibration

Pressure, psig	Axis	Duration, min.

For details of frequency response, see report prepared by outside test lab.

Post vibration leak test

SHD (vent port capped)		MHD (vent port uncapped)		INTERFACE	
PRESS psig	LEAKAGE sccs	PRESS psig	LEAKAGE sccs	PRESS psig	LEAKAGE sccs

REMARKS: ______

TESTER ______

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4.9 Burst

_____ psig applied for _____ minutes. (Mated disconnect)
_____ psig applied for _____ minutes. (MHD)
_____ psig applied for _____ minutes (SHD)
_____ psig applied for _____ minutes (Mated)
_____ psig applied for _____ minutes (MHD)
_____ psig applied for _____ minutes (SHD)
_____ psig applied for _____ minutes (Mated)
_____ psig applied for _____ minutes (MHD)
_____ psig applied for _____ minutes (SHD)

Maximum pressure achived without permenent deformation: _____ psig
Maximum pressure overall _____ psig.
Description of deformation _____________________

____

Description of fracture (if any) _____________________

____

4.10 Post Test Inspection
(Record measurements, description, etc.)

____
____
____
____

REMARKS _____________________

TESTER _____________________